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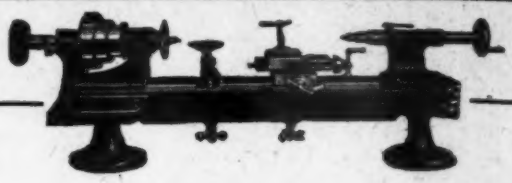

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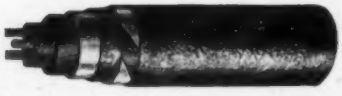

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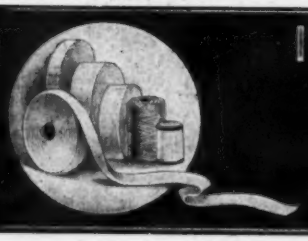

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ELECTRICAL REVIEW.

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THE PRINCIPLES OF WAGES DETERMINATION.

The cry for economy at any price is heard on all hands, and the first item of expenditure to be tackled, with a view to reduction, is almost invariably that of wages. Whether the remuneration to be examined be official salaries, national or municipal, or the wages of operatives, this item of direct expenditure, precisely because it *is* direct expenditure, is so situated in the industrial prospect as to attract the first attentions of the economiser.

It is not our intention to deny that wages, like every other expense, must be constantly watched, with a view to obtaining the highest return for the expenditure laid out. That is only to make for business efficiency, the first aim of every true engineer. Our object is rather to draw attention to the true principles by which the reward of labour, whether of the head or of the hands, ought to be determined. That there are such principles must be clear to the minds of our readers, who are accustomed to think in engineering terms, and to deal with engineering problems; but to the lay mind, to the man in the street, who takes most of his views straight from the pages of his daily or weekly stunt-monger, the very existence of any principles at all tends to be obscured by the incoherent clamour of every ignoramus who stands on a stump and yells "Anti-waste," or anti-anything else, if that will help him to grind his own axe.

The presidential address delivered by Mr. W. L. Hichens before the Economic Science Section of the British Association on September 8th, is one among a number of efforts now being made by the great engineering employers to bring home to the workers an adequate knowledge of the facts of the industrial situation, and of the economic laws which govern it. Mr. Hichens is the chairman of Messrs. Cammell, Laird & Co., Ltd., the steelmaking, engineering, and shipbuilding firm, of Sheffield, Birkenhead, Penistone, &c., and he speaks with an authority and experience not to be gainsaid. Wages have to be paid out of the accumulated wealth of the community, and that accumulated wealth comes, and can only come, from the receipts of industry—in other words, from the sale of goods. The law of supply and demand operates to make the sum total of industry vary in a periodic fashion, the periodic times being more or less irregular. Since industry varies, wealth must vary, and consequently wages must vary. During the period of unexampled industrial activity brought about by the war, wages rose to unprecedented levels. The scarcity of labour was one reason, leading to a higher rate of real, or commodity, wages; the scarcity of provisions, bringing about higher expense, and increase generally in the cost of living, was another, leading to a higher rate of apparent, or money, wages. The present is a time of depression such as has not existed within the memory of most present-day workers, though many equally bad, and worse, crises have been recorded in the history of every country.

The natural operation of the law of supply and demand makes money wages low when goods are plentiful, and high when they are scarce. The real state of wages, represented by the purchasing value of money, may remain much the same in both cases. In times of plenty, and consequent cheapness, labour has a tendency to become scarce, because people start in business for

themselves, and do not want to work for employers. This tendency must have been apparent to most of our readers, who will, without difficulty, be able to recollect numerous instances that occurred within their own circle of acquaintance during the boom years 1919 and 1920. The apparent prosperity of those years was, as nations and individuals are finding out to their sorrow to-day, largely a will-o'-the-wisp, and most of those who ran after it became engulfed in the difficulties of the situation. When prosperity wanes, those who have not been sufficiently successful on their own account, seek employment again, and this alternate scarcity and plenitude of available assistance raises and diminishes wages, against the operation of the ordinary considerations of supply and demand.

The next principle is that of the living wage. All must agree that subsistence well above the poverty line is the due right of all who are willing to work for it. Views of what is a living wage must necessarily vary, and must generally advance, as the standard of living of the community varies. It is an ideal, however, and the realisation of ideals, however desirable, must necessarily be regulated by facts and circumstances as they exist from time to time. The subsistence expenses of a married man with a family must necessarily be greater than those of a single person, but the suggestion put forward by Miss E. F. Rathbone, that wives and children should be provided for from a fund contributed equally by single and married men would not afford a satisfactory solution. In his book,* recently reviewed in our columns, Mr. J. S. Hecht advocated the establishment of a living wage based upon the daily necessaries of life of the average man with the average family; and in our view the wage paid to every full-time adult worker should be such as will permit him to marry and bring up a family. It is highly undesirable that a man should be obliged to notify his marriage or the birth of each child, as a ground of increase of remuneration. If private employers paid on such lines, who will doubt that single men would be employed in preference to those with family responsibilities? Private employers will not wish to undertake the administration of such a fund as Miss Rathbone suggests, and we have had enough of State administration for the present.

Mr. Hichens advocates, as his third principle, that of payment by results. This has much to recommend it, and the trader on his own account lives by the results he obtains. In great organisations, however, it is exceedingly difficult of application, and most large industrial firms in the electrical industry have passed through the phases of attempting to apply this system of payment and then abandoning it. The trade unions concerned bitterly oppose it; and if we could depend on everyone doing his utmost, and so endeavouring to deserve the best possible remuneration, we ought not to jump to the conclusion that they are completely mistaken in their opposition. Piecework is a form of payment by results, but it is largely modified by "ca' canny." In discussing this question Mr. Hichens briefly touches upon women's wages, and reaches the conclusion that for a number of reasons they must be lower than men's. Experience seems to show that at present it is the exception to find women doing the same work as men. What may be the case in a generation's time one cannot prophesy now.

Mr. Hichens next mentions, under slightly different designations, the five principal circumstances governing inequalities in wages, viz., the agreeableness or disagreeableness of the employments themselves; the easiness and cheapness, or the difficulty and expense of learning them; the constancy or inconstancy of employment in them; the small or great trust which must be reposed in those who exercise them; and the probability or improbability of success in them—all of which are fully discussed in Part I, Chapter X, of Book I of Adam Smith's "Wealth of Nations." Considering that this work was published in 1776, it is remarkable how much of it might, with equal aptness, have been written to-day.

Finally, he discusses profit-sharing, finding in it the defect we have so frequently pointed out, that the financial result to any individual worker is insignificant. Moreover, it does not tend to the efficient development of business enterprises that all profits should be distributed, whether as dividends or as additions to wages. The investment of profits in the improvement and extension of the business is one of the first cares of the enterprising individual trader, and this is one of the best means of increasing the amount of employment provided by the business.

The whole wages question is always with us. It is of almost primeval age, yet ever new. It is not to be expected that a permanent settlement will be reached, but all considerations seem to point to the fact that joint control of industries by employers and employed, or Whitleyism, is the most likely method of reaching satisfactory results, and periodically reviewing and adjusting those results, that has been suggested up to the present time.

* "The Real Wealth of Nations, or A New Civilisation and its Economic Foundations." By John S. Hecht. Elec Rev., March 4th, 1921, p. 295; and Elec. Rev., April 8th, 1921, pp. 442-3.

Good News from Japan.

"Japan was the first to break: will she be the first to mend?" This important question is discussed in an interesting report by H.M. Commercial Counsellor at Tokio (Mr. E. F. Crowe) and the Acting Commercial Secretary (Mr. G. B. Sansom), which has been issued this week by the Department of Overseas Trade. The question is important from the point of view of the recovery both of Japan's purchasing power and of her capacity to export. Although the British Commercial Representatives naturally do not commit themselves to a definite answer to this question, they give some very plain and useful indications. From these certain deductions may be made which should give great satisfaction to the British trader. The report does not agree with the pessimists who believe that the worst is yet to come. It points out that importation is beginning to revive, accumulated merchandise to be cleared, and confidence to be restored. Japan acquired, during the war, infinitely more catholic tastes with regard to foreign goods, and still possesses the means with which to gratify them. The United Kingdom should have an excellent chance of catering for these new requirements, for she enjoys a splendid reputation in Far-Eastern markets. Japan appears, in fact, to be in the exceptional position of having recovered her purchasing power, whilst her export business still remains under a cloud. This brings us to an aspect of the situation which is of particular interest to the electrical trade, namely, Japan's capacity to manufacture for oversea markets. Much has been heard during the past few years of the flooding of China, Australia, India, and even South Africa and South America with low-priced goods produced by cheap Japanese labour in imitation of Western manufactures. Examples which our readers will readily recall are lighting fittings, wires, lamps, and other small electrical accessories. Cheap these were without doubt. Whether they were worth the exceedingly low price asked for them depended largely upon the amount of British raw material that entered into their manufacture. Mr. Crowe and Mr. Sansom, in their report, do not refer specifically to this class of goods. But in alluding to the fact that Japan's export trade is at a standstill, they state plainly that her present costs of production are too high. Furthermore, the high exchange value of the yen adds to the difficulties of finding markets for her goods in the impoverished countries of the world. Another weighty factor against Japanese competition abroad is, we know, the failure to maintain quality. Meanwhile, so long as the domestic demand is good and Japanese articles remain high in price, there will be opportunities for selling British products.

THE BLACKBURN (EAST) ELECTRICITY WORKS.

For some years before the war the need for an increased electrical power supply had been occupying the attention of the Blackburn Electricity Committee, and in 1912, Mr. P. P. Wheelwright, engineer and manager of the electricity department, submitted to the Town Council preliminary plans for a complete power station to contain two 5,000-kW turbo alternators, with the necessary boilers and accessory plant. These plans were sympathetically received by the Town Council, and after careful consideration a scheme based upon them was drawn up and submitted to the Board of Trade which in 1914 granted its sanction for the work to proceed. As a result of this the requisite land was bought, and it is upon this land that the present station is being erected. During the war the scheme was held in abeyance, and when in 1919 the Council returned to a reconsideration of the plans it was found that the wider experience of the advantages of the electrical drive obtained during the war, and the consequent increased popularity of this form of power, had increased the demand for electricity in the district so that it greatly exceeded that anticipated in 1914, and accordingly the original plans were redrafted to make provision for a station of double the the original capacity. The present station will, therefore, contain two 10,000-kW turbo-alternators.

Tenders for the comprehensive carrying out of these plans were invited, and that of the English Electric Co. was accepted by the Council in August, 1919, and work was commenced immediately upon the first power station to be built under the auspices of the Electricity Commissioners. Sir John Snell, and the Electricity Commissioners under his chairmanship, have exhibited the warmest and most practical sympathy with the work.

Credit is due to Mr. F. G. Mitchell, of the Mitchell Conveyor Co., who prepared designs of the structure in such a way that steel work was ordered within the first month of the contract, and during the progress and erection of the job no radical alterations have been necessary, nor has delay been caused.

The ground forming the site of the station was waterlogged, and some form of artificial foundation had to be employed. In preference to erecting a building on piles, it was decided to build a concrete raft. Before building the raft a special line of broad-gauge railway, 1,000 yards long, was laid from the local gasworks siding to the site of the station to facilitate the bringing up of material. The raft was completed, and the foundation stone was laid on May 13th, 1920. After this the progress was rapid; two months later the steel columns were up, in another two months the steel structure was complete, while before the end of the year the whole building, both boiler house and engine house, had reached its final stages. In the meantime the foundations for the cooling towers had been laid, well boring was progressing, the wharf was built and the canal dredged, cranes were erected both inside and outside the building, foundations were laid for the machinery, an electric locomotive was delivered, and all the various parallel works had been carried out.

Within one year of the laying of the foundation stone, the boilers, the economisers, the condensers, the feed pumps, the circulating pumps, the ash-handling plant, the soot blowers, the switchgear, the cranes, the coal conveying and mechanical stoking plant, the turbine and the alternator for the first half of the station were delivered, and to-day, when the opening ceremony takes place, finds the first half of the station in commission; it is expected that the station will be complete and in final running condition before the early spring of next year.

In designing the plant special care has been taken to ensure that the supply of coal to the station shall be economically dealt with, and so arranged that the department is free to receive coal either by canal or rail.

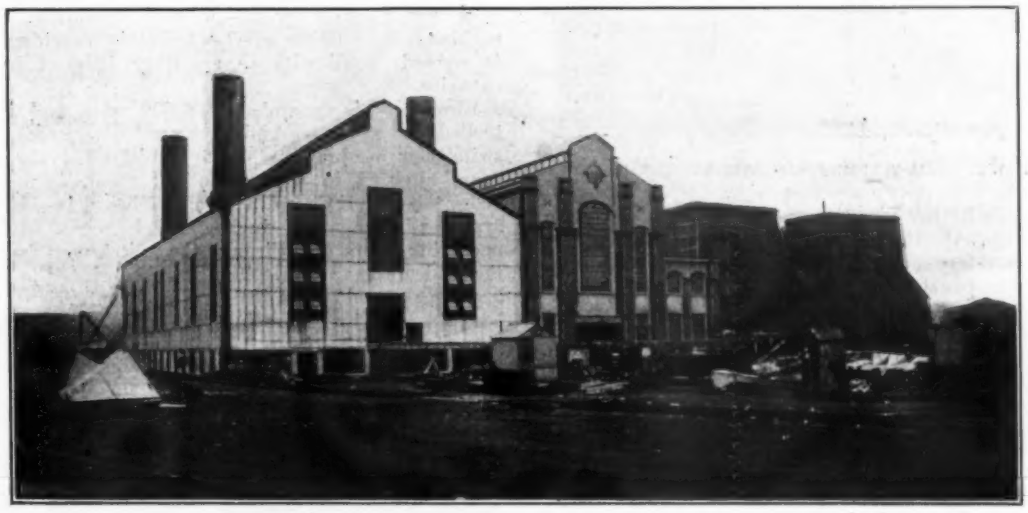


Fig. 1.—Exterior of Blackburn (East) Power Station.

The main 20-ton travelling crane represents the complete receiving, storing, reclaiming, and weighing plant for the station. The full wagon is lifted by the crane, weighed by the crane operator, discharged into the coal-hopper or on to a storage heap and the empty wagon weighed again before being replaced on the track, so that the net weight of coal is ascertained. The one crane operator discharges the wagon and weighs the coal, thus cutting out the weighbridge with capstans and attendants, and the shunting usually necessary. When the coal is not to be placed into stock it is discharged direct by the crane into the receiving hopper of a skip hoist. The skip hoist and belt conveyor work automatically, one ton of coal being fed by weight into the skip every time the skip is elevated. The operations are counted so that a correct record of the amount of coal passed up into the bunkers is kept. A maximum of 40 tons per hour can be dealt with in this way. In addition to lower power consumption the upkeep and general repair costs of a skip hoist are very light compared with any other form of elevating gear. A Mitchell belt conveyor distributes the coal to any portion of the bunker, and completes this plant, which, it is claimed, is the most efficient that could be devised.

When unloading from barges or reclaiming from store, an electric grab is attached to the 20-ton crane. This grab has only to be hooked on to the crane ropes. The power for closing the spades is provided by a motor inside the claw of the grab itself, which makes it possible for the same grab to be attached to any other crane that may be installed, and retain all the advantages of a double-rope grab.

For removing the ashes from the boiler house an electric battery locomotive is employed; this hauls a specially designed truck under the ash pit door, where it is filled. After loading, the locomotive takes the truck to a patent distributor outside, where the ashes are discharged on to a moving belt which distributes them over the surrounding ground. By the arrangement of the distributor a wide area of discharge is obtained, and the one man who drives the locomotive also attends to the

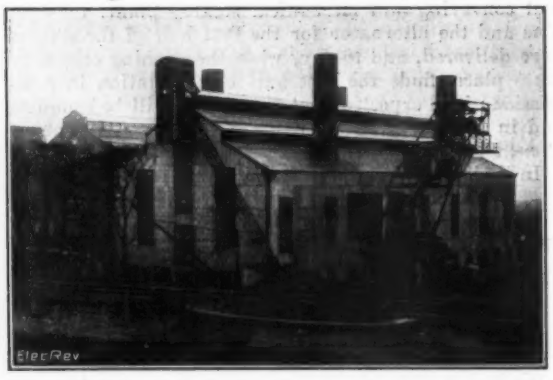


Fig. 2.—Coal-handling Apparatus and Canal.

distribution of the ashes on the ground which has to be made up. On the present site the amount of ground which has to be made up is considerable, so that a dump for ashes is provided for many years. A fixed-radius jib crane is also provided for use in the event of the 20-ton crane being out of commission. This is fixed in position near the canal wharf so that the path of the radius arm covers both the barges moored alongside and the underground hopper.

The boiler room plant comprises seven boiler units of the Babcock & Wilcox type, each having a steaming capacity of 50,000 lb. per hour as a normal duty. Each unit is fitted with a superheater and superimposed Green economiser of the horizontal tube type and three mechanical stokers of the Underfeed self-contained, forced-draught, travelling-grate type. Coal is fed to the stoker hoppers from the overhead bunkers through chutes fitted with control valves. The coal burnt by the stoker is measured as it passes into the furnace by Lea coal meters attached to each stoker. The ash and clinker from the stokers is dropped into special ash chutes built to the underside of the stokers and is emptied into trucks running on a special track fixed in the boiler room, whence it is conveyed to the distributor. Steam is generated at a pressure of 210 lb. per sq. in. and superheated to a total temperature of 600 deg. F.

Each boiler is provided with a polished enamelled slate panel carrying two steam-flow recorders and indicators; a CO_2 indicator; a dial draught gauge; a pressure recorder; and a six-way temperature indicator for registering the temperatures of the economiser inlet and outlet water, economiser inlet and outlet flue gases, and the steam temperature at the superheater box.

The boilers are operated on the balanced draught system. The stokers are provided with separate forced draught fans, and the chimneys are divided into two portions at their lower sections and fitted with induced draught fans which draw the gases of combustion down one section of the chimney from the outlet of the economisers and discharge them upwards through the other portion of the chimney. This arrangement ensures the maintenance of efficient combustion with fuels of varying heat values. Each boiler unit is fitted with a soot cleaning equipment, consisting of a rotary device for directing steam at high velocity on to the tubes while the plant is in operation. These appliances are so situated that the whole tube area is covered by the rotary jets, which are periodically operated by hand. This is the first large power house in Britain to be equipped throughout with this plant. It abolishes the necessity for hand lancing, a costly and very often inefficient method of keeping the boilers clean, and, moreover, these equipments will effect a remarkable saving in fuel consumption.

The circulating water for the surface condensers, after passing through the condensers, is pumped into four cooling towers, where it is cooled down to a temperature of about 75 deg. F. A pond is constructed under each tower, from which the circulating pumps draw their supply. The only new water to be provided, therefore, after the initial starting up is that necessary to make up the losses caused by evaporation and wastage, which will be obtained from a well sunk near the cooling ponds. Condensing water can also be taken from the canal and afterwards returned.

The pipework between the pumps and towers is interconnected so that it is possible for either pump to draw water from or discharge it to any one or more of the four towers. An emergency supply tank is provided, situated upon the roof; this has a capacity of about 18,000 gallons. This tank will also be used for emergency water supply for any point of the station. In the turbine house a 60-ton overhead electric travelling crane is erected, fitted with an auxiliary hoist of 10 tons capacity.

Electricity is generated at 6,600 volts, and is controlled by an extra-high-pressure switchboard. The switchgear comprises separate cubicles for the e.h.p. gear, situated in a separate cell room, immediately below the control desk. The control board is of the desk type, and is mounted in the switch room, while the operating levers pass through the switchroom floor into the cubicle room below. The gear is designed to have a breaking capacity suitable for direct connection to busbars supplied by generating plant of much larger capacity.

The turbo-alternator plant consists of two 10,000-kW impulse turbines and 6,600-volt, 50-period, 3-phase alternators supplied with cool washed air from a patent air filter.

Fig. 3.—Interior of Engine Room.

Each set is complete with surface condenser, extraction pump, circulating water pumps, &c. The steam from the turbines after being condensed is passed through a "closed feed system." The condensed steam is fed direct to the suction of the turbine-driven boiler feed pumps, which feed the water directly to the inlet of the economiser, where it is heated during circulation by the combustion gases. The delivery into the boilers is regulated automatically by Copes feed regulators. There are three turbine-driven boiler feed pumps, each capable of supplying three boiler units, so that with the whole station in operation there is one spare feed pump.

For the auxiliary plant, alternating-current supply will be transformed down to 400 V by three 500-kW transformers, which are connected to the low-pressure a.c. switchboard. This board may also be supplied, if necessary, from the Jubilee Street station.

To provide a supply for the d.c. motors and station lighting there are three 320-kW rotary converters, which draw their incoming supply from the 400-volt a.c. board and supply d.c. to a 400-volt switchboard. These rotary converters are arranged so that in the event of the main generating sets not being in operation they can be operated by a supply from the Jubilee Street station.

Fig. 1 is a reproduction of a photograph conveying an idea of the size of the station; the skip hoist which takes the coal up to the distributing belt is seen (not very clearly) to the left of the background. Fig. 2 is another exterior view showing the coal-handling gear and the canal from which the feed water is taken. The interior of the engine-room is shown in fig. 3; the switch-room, offices, &c., are to the right. The first set is seen in position, and the foundations for the second set appear in the foreground. Two rotary converters are in an enclosure seen at the back of the picture, the third being hidden.

The welfare of the station employés has received close attention, there being ample accommodation for meals, a number of bathrooms, and lavatories. The station is well lighted by day and night, both boiler house and turbine room having glass roofs. The switchroom, mess-rooms, offices, &c., are finished off with glass tiles, and the floors are made up with "Doloment." It is thus possible to clean out all the rooms by means of a hose pipe. One end of the switchroom has a blank wall, and upon this it is proposed to draw a diagram of the whole Blackburn system; this will be of great assistance to the engineers.

Taken as a whole, the station represents an excellent example of up-to-date practice, and Mr. Wheelwright and the English Electric Co., and its sub-contractors, are to be congratulated upon this valuable addition to the power system of the district.

INSTALLATION COSTS, AND THE DEVELOPMENT OF NEW FIELDS FOR ELECTRIC LIGHTING.

For the timely and suggestive notes which follow we are indebted to Mr. J. W. Beauchamp, director and secretary of the Electrical Development Association; we reproduce them practically in his own words, in the hope that they will help to stimulate enterprise in the direction of popularising the use of electricity:—

I think most people in the electrical industry are beginning to realise that within the past two years there has been a most notable increase in public approval of electricity and electrical methods. The Press deals with letters, articles and references, direct or indirect, on the advantages of electricity, and the immense benefit which must follow from its wider use. A very large section of the people are quite convinced that they wish to use electricity, and will do so as soon as they possibly can.

Although costs have risen so much, one hears of fewer complaints about the price of electricity or of electrical apparatus than one hears about the difficulty of getting connected and supplied. Nevertheless, I feel at the present time that the great check upon new electric lighting business lies in the difficulty which many people are experiencing in paying for installation work.

With regard to lighting, a few points must be kept clearly in mind:—

1. That we have obtained most of the business available from the fairly well-to-do and the rich, whilst in commerce and in industry electric lighting is adopted automatically for all extensions and new enterprises.

2. Therefore our great field of further lighting business lies with the middle class, and amongst the houses inhabited or to be inhabited by working people in the ordinary sense of the term.

In securing further lighting business one achieves much more than at first sight appears. Electric lighting opens the door to all other forms of electrical application; with the exception perhaps of power, one seldom or never hears of any application for electricity supply without lighting—almost always it is the introduction to the use of electrical energy for heating, cooking, and mechanical purposes. Even in shops and factories where electricity is sometimes sought for mechanical power only, the electrical engineer knows by experience from the day it goes in that the gas or other lighting is doomed.

For these reasons I feel that one can never do too much to bring about the addition of new lighting installations, and that those who work towards that end perhaps in the first instance for their own immediate benefit are really assisting the whole of the industry—electric lighting is the spear-head of the business.

I have been tempted to present these remarks again at the present season of the year, although to many they must be platitudes, because it has been brought home to me that there are some places, perhaps a good many, where the price of electrical energy has not risen during recent years so rapidly as the price of gas, and consequently an admirable field for additional business exists if only something can be done to cheapen services, internal wiring, and fittings, that is to say, to cheapen the "all-in" cost of the installation to the landlords or tenants concerned.

Only recently I met a case where electricity had not gone beyond 8d., whilst gas had steadily climbed to 7s. per 1,000 ft. There was not any wide use of electricity amongst the houses of the town, one which has passed through a great deal of adversity and where money is not plentiful, but some of the people who were using electric lighting voluntarily explained the fact by saying that it was "so much cheaper than gas."

Although we are aware of the truth of this statement, it is not often that it is put to us so clearly.

It is perhaps worth while to look at this matter from the point of view which the E.D.A. has already adopted with regard to heating and cooking.

It will be remembered that figures have been prepared showing roughly the commercial relationship or competitive values of electricity and gas for domestic heating and cooking by means of arbitrary figures of merit relating the cost of a kilowatt-hour to the price of 1,000 ft. of gas.

Similar treatment with the rates in vogue for lighting leads to quite startling results in some cases. For example, we know that in many places 1s. is charged for electricity, whilst from 4s. 6d. to 5s. 6d. per 1,000 ft. for gas is not an uncommon figure; in these districts plenty of business can be done where the cost of installation is not too serious a factor.

Now, the lighting figure-of-merit in such a case may be called 5, produced by dividing electricity at 1s. into gas at 5s. Turn to another town where electricity is still standing at 8d. a unit and gas has risen to 7s.; the figure-of-merit is something of the order of 10, from which one may deduce that new business should be very easy in the latter district.

I would suggest that it is well worth while to consider these relative values for all applications of electricity; the results tend to direct one's efforts into the best channels for immediate effect, and although allowance must be made for the varying conditions of different people and districts, yet it does appear that there are still plenty of areas where a little assistance in propaganda towards cheaper wiring systems, or more particularly methods of assisting supply undertakings to provide installations on hire or hire purchase, should lead to a very considerable further development.

New lighting business to-day is worth a good deal more to the contractor than was the case a few years ago, because it is now possible to follow it up with many applications of electrical energy which were not freely available before the war.

NOTES CONCERNING CONTACT PYROMETERS.

By "ELECTRODE."

A pyrometer has been jocularly described as an instrument whose use will, in the hands of different persons, produce either good results or bad language. That it is possible to achieve the former, renders it at once worthy of consideration, while its being the cause of the latter invites investigation.

Pyrometers may be divided into two distinct classes, and the purpose of the present article is to review the contact or tube-stem pyrometer (which is so familiar in engineering shops) rather than the radiation or optical type which requires more skilful manipulation. The thermo-electric pyrometer stands alone, as a device,

Fig. 1.—Fibre Insulating Bush.

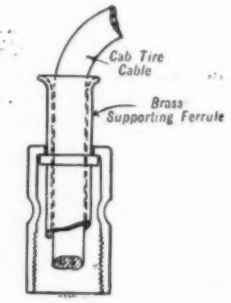


Fig. 2.—Cable-supporting Ferrule.

for the measurement of high temperatures with precision, but like all moving-element instruments it is not, nor is it intended to be, fool-proof.

The accurate measurement of temperatures is a question of supreme interest to electrical engineers to-day, just as it is the desideratum in the foundry and tool room. In certain avenues of the electrical industry, it would appear to be more satisfactory to train the manual and non-technical worker into the intelligent handling of the simple indicators and measuring instruments he has been selected to use, rather than rely upon a series of safeguarding devices which, while they may add robustness, usually impair the sensitivity of an instrument.

The former practice was adopted in connection with furnace attendants and tool-room operators, to whom the function and uses of thermo-electric pyrometers was simply explained, together with a few hints regarding careful handling and the importance of clean and firm contact.

The result, in a large works where something like a score of such portable pyrometers are in daily use, has been satisfactory, and its success demonstrated by the very infrequent calls upon the services of the electrical section to remedy any minor defects.

In the early days the tool-room mechanic and the foundry men viewed the introduction of pyrometers with scepticism, and used them with a tolerant attitude, but to-day, after a period of ten years, it can be recorded that the failure of an indicator to read off the zero is sufficient to induce a state of mental agitation in any of the attendants. Portable instruments are more prone to depart from the path of strict veracity than the wall or switchboard pattern, because they are subjected to innumerable shocks and stresses during handling and operation.

A pyrometer may be divided into three main components, viz.: (*a*) The indicator or galvanometer; (*b*) thermo-couple or tube stem, and (*c*) connecting leads and connector. It is a tribute to pyrometer manufacturers that, in so far as the writer's experience is concerned, only isolated cases of failures have been traceable under headings (*a*) or (*b*). The admission of dust through the imperfect refitting of the hardwood casing of the indicator caused the moving element to stick in one instance. Regarding item (*b*) two distinct and separate failures are recorded. The fibre insulating bush (B, fig. 1) disintegrated after long service in a hot situation, short-circuiting the couple, while the remaining breakdown was simply due to the warping of the tube stem, this causing intermittent contact between the stem and the alloy rod.

At least 75 per cent. of the defects noted have been caused by the flexible connecting leads chafing and breaking away from the swivel connector to which they are attached, or, by indifferent contact, established when the latter has been screwed down.

To affix a robust brass connector to a length of flexible of similar grade to that in common use for ammeter shunt leads is inimical to long service in the works, although it may satisfactorily meet laboratory conditions. Repeated breakages of the indicator leads at the point of entry into the brass connector, led to the adoption of "workshop" and other protected flexible wire, with somewhat better results. Even this grade of cable would obviously not withstand the normal conditions to which portable pyrometers are subjected, and by contact with the floor, or not too gentle stowage, soon lapsed into a perished condition.

Finally, a cab-tire-sheathed cable was tried, after consideration, and, to lend additional support to this heavier cable, a long brass ferrule was fitted into the top screwed coupling (fig. 2).

This furnished the requisite mechanical strength; for the instrument to which this cable was attached has now been in service continuously for over two years and is the cherished companion of a certain foundry operator.

With regard to the reliability and accuracy of thermo-

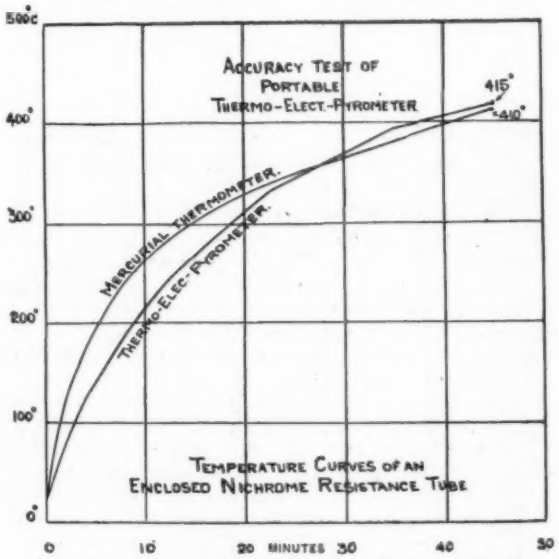


Fig. 3.—Accuracy Test of Portable Thermo-electric Pyrometer.

electric pyrometers, the advisability of periodical verification is recommended, just as switchboard measuring instruments are (or should be) similarly calibrated. The wisdom of this course was demonstrated some time ago when, in connection with a steam generating plant, the reading of the indicator attached to a superheat steam couple was openly disputed by the boiler-house superintendent, who also added gratuitous opinions on thermo-electric pyrometry.

Reference to the "filing" cabinet revealed the fact that this particular pyrometer had emerged from a

recent check test remarkably well. But "as one man's word is no man's word," a spare thermo-couple together with its pyrometer were verified in a pure lead bath, and against a mercurial thermometer, by coincident immersion. This was substituted for the doubtful apparatus, and a comparatively similar reading was shown for the steam temperature. Thereupon the boiler was shut down, and finally a defect localised in the superheater system.

The thermo-couple which had been displaced was then inserted, together with a mercury thermometer, into a small metallurgical resistance furnace to ascertain its behaviour by direct comparison, and to obtain some idea of its "time constant." Simultaneous readings were taken every two minutes and the values, precisely as observed, plotted as shown in fig. 3. The result was gratifying, especially as this particular pyrometer had been in service for several years.

Too much care cannot be taken to establish perfect electrical contact at the junction of the indicator leads and the stem of the thermo-couple, as the following resistance values, which were obtained when testing out the pyrometer outfit under review, will testify:—

Resistance of galvanometer moving coil, 3.1 ohms.
Swamping coil (galvanometer) resistance, 2.0 ohms.
Flexible connecting leads, 0.15 ohm.
Thermo-couple (cold) complete, 0.31 ohm.
Thermo-couple (600 deg. C.) complete, 2.5 ohms.

The galvanometer or indicator was found to give a full-scale deflection of 1,200 deg. C. with 80 milli-volts so that when indicating 600 deg. C. the "drop" across the galvanometer would only be 0.04 volt (approximately). These tests were made solely in order to obtain useful information regarding pyrometers under practical conditions, and to ascertain the "reliability factor" of such instruments when compared with other temperature measuring devices and methods adopted in the realm of industrial engineering.

BOILER HOUSE TECHNIQUE.

(Communicated.)

Pending the use of more modern plant and the achievement of coal saving due to linking-up, it may be worth while to consider if something can be done to get an immediate (even if small) improvement in the average steam-raising efficiency of public electricity works.

In most stations engine-room efficiency can only be raised by expenditure on plant. There are, however, but few power houses where some small saving cannot be made in the boiler house.

Some moderate increase in maintenance cost or more often the employment of additional and skilled supervision will in many cases enable the extra expenditure to be covered by savings in fuel burned.

Expenditure on testing appliances and refinement in fuel-saving apparatus has often failed to produce a continuous return because such capital expense has not been supported by proper maintenance and supervision. Steam-raising plant is subject to rapid deteriorating influences—it is operated by men who, whilst perhaps having as much knowledge of the principles underlying their work as those responsible for the engine room, are in the boiler house able to make or mar economical results more immediately than is the case with other portions of the plant.

The principles are known, as well as the remedy; it lies in sound equipment, ample maintenance and educated supervision. The difficulty with many of the smaller undertakings is to find suitable men, and persuade the employer body that it is worth while to keep supervisors who apparently have little to do and call for a fairly high scale of wages.

It may not be impossible to suggest a means whereby action which is usual in large undertakings could to an extent be imitated in small ones in order to achieve an increase in average efficiency and reduce the amount of coal handled and destroyed, whilst waiting for the smaller plants to be superseded.

The collection of statistics of coal consumption per kWh in central stations, as carried out by the Coal Controller during the war, should be continued (possibly it is being continued); these statistics could be roughly sorted into classes, according to load and plant conditions, when for each class a fair (coal per kWh) value could be assessed; failure to reach that figure would become a condition undesirable to those in charge of works. Such a system of checking results should be accompanied by practical assistance in improving the efficiency of the staff employed and in supporting the responsible engineers in any application to their authorities for more assistance or expenditure on upkeep.

Instructions in steam practice might also be given to responsible members of the staffs of undertakings where results were deemed to be unsatisfactory.

This could best be carried out by selecting (with the agreement of the owners) a few medium-sized works in different parts of the country, such works to be notable for achieving good coal figures without undue expenditure on "methods" and with load conditions as normal in the smaller works.

These selected works would then be used as demonstration centres, men being sent to observe and assist in running and maintenance (boiler house only) for suitable periods; in this way the men from small stations might find a stimulus towards better results and learn that the secret of boiler-house efficiency lies in continuous supervision of the unskilled, and never-ending attention to the state of the plant, rather than in the possession of costly instruments and checks.

Some of the smaller stations are weak also on records; it is possible to find in the general offices statistics of flue gases and other check figures which seem highly improbable after an inspection of the plant.

The demonstration courses suggested would awaken many to the fact that test figures are of most interest when they reveal faults.

Briefly, the idea consists in admitting that many of those who actually supervise the burning of vast quantities of costly fuel are, by no fault of their own, of very limited training and experience in the technique of steam raising. The same reproach applies to the private manufacturer—he will often maintain a costly staff and laboratory to check the food or other product which he produces, whilst leaving his fuel bill to the mercy of men whose wages may amount to but a minute percentage of its value.

If it were possible for the Electricity Commissioners to initiate such a scheme as indicated they would do doubt have the assistance of the Coal Mines Department, and the work would be in a way complementary to that of the Fuel Research Board. Any instruction or experiences offered could be supplemented by experts in boiler design and the use of coke and special fuels.

During the war the Coal Controller had an advisory organisation in being, and did to some extent check the performances of public utility undertakings and manufacturers by inspections carried out and reports made, but possibly the converse method—*i.e.*, getting the actual men engaged on the work to leave their plants for short periods and to act under guidance in other and somewhat better plants—would have a more lasting effect, and make them more useful, confident, and less apt to feel that nothing better can be done than they are at present doing.

It would be worth while to secure the friendly co-operation of the Electrical Power Engineers' Association in work of this kind; that body has, by collective bargaining, raised the scale of payment to its members, and probably realises that in some cases it may have succeeded in securing a wage which, whilst "right for the job," may not necessarily be right for the man now in it or for the way in which that job is now performed.

UNEMPLOYMENT INSURANCE AND ELECTRICAL ENGINEERS.

By JOS. J. H. STANSFIELD, F.C.I.S.

The passing of the Unemployment Insurance Act, 1920, extended the provisions of the principal Act passed ten years ago to all employed persons with certain exceptions mentioned, the exceptions being similar to those which apply to National Health Insurance.

There were many engaged in trades or businesses who would have preferred to remain outside the new Act, and when it was recently decided by Mr. Justice Roche that engineers who looked after electric lighting plant were not insurable under the Act, they may have rejoiced.

The decision of his Lordship will, however, not affect a large number, but the grounds of the decision may be of interest to electrical engineers generally.

The exceptions referred to include "employment in domestic service except where the employed person is employed in any trade or business carried on for the purposes of gain."

The Junior Carlton Club employed a number of persons on the Club premises, including one who was an engineer whose duty it was to look after the electric light, and as the Club was not a trade or business carried on for purpose of gain, the Club authorities objected to pay, or call upon their employés to pay, the contributions required by the Act.

The Minister of Labour had decided that contributions were payable, and an appeal having been made against his decision, it was argued before Mr. Justice Roche on June 30th last, when the appeal was allowed. His Lordship stated that by the Act of 1920 domestic servants were not insurable, and after referring to a definition or description of "domestic servant" in Pearce *v.* Lansdowne (69 L.T. 316), he said he thought that domestic servants were persons whose function it was to be about their employers' persons or establishments for the purpose of administering to the needs or wants of such employers or of those constituting the members of such establishments or of those resorting thereto, including guests. That covered the case of club servants, who were, therefore, domestic servants and not within the Act.

The object of the Unemployment Acts is to insure against unemployment, and it may be that whilst some club servants will be relieved at the decision, others would have preferred to have the decision of the Minister of Labour confirmed, and it may be pointed out that Section 4 of the Act of 1920 allows the Minister to include any exempted employments, but subject to a draft of the Order being laid before each House of Parliament for not less than twenty days during which the House is sitting, and provided that no address by either House against the Order is presented to His Majesty.

But so far as regards electrical engineers generally, whatever their views of the Act may be, they, with their employers, are (within certain limits of age and remuneration), still liable to pay contributions to provide against unemployment.

Lighting Plants in Argentina.—In reporting on the large number of separate electric lighting installations which are to be found in Rosario, Fanta Fé, the United States Consul there remarks that they should prove of interest to the exporter, as consumers of lubricating oil, belting, lamps, and accessories. Both British and Continental electric lamps are competing with American makes. The size of the various plants varies from 18,000 kW (Rosario) down to 15 kW in small outlying towns. Only eight are 3-phase a.c., four of which are at Cordoba. Three plants at Cordoba are 60 cycle, and the other five a.c. plants are 50 cycle. One of these 3-phase, 50-cycle plants is on the Lules river at Tucuman, and develops 3,750 kW.; another is the central plant at Rosario. Practically all the small enterprises are wood-burning plants with d.c. service.

LEGAL.

Newbury & Thomas *v.* Levinsky.

At Southwark County Court on October 13th, an action was brought by plaintiffs, electrical engineers, of 66, Westminster Bridge Road, London, S.E., to recover £16 15s. from J. Levinsky, proprietor of the Electra Picture Palace, West Norwood. The defendant entered a counterclaim for £36 2s. 6d. Counsel explained that the claim was for repairs to an electrical apparatus used at the theatre for the production of kinema pictures. In August, 1920, the plaintiffs were asked to estimate for certain repairs. The work was completed, but after a time the defendant complained that it was not at all satisfactory, and that the apparatus was still defective. He had to call in the services of the Crypto Electrical Co., whose bill was the subject of the counterclaim.

Evidence having been heard, his Honour Sir Thomas Granger gave judgment for the plaintiffs, whose evidence he accepted that there was no complaint until two months after they had done the work. In his opinion, the defendant wanted the machine "tinkered" instead of spending a proper sum to put it into thorough repair. The plaintiffs had done what they were engaged to do, and had done it thoroughly, and the work which had since arisen was due to the reason he had explained. He gave judgment for the plaintiffs for the amount claimed with costs, and the counterclaim was dismissed with costs.

The Attorney-General *v.* Liverpool Corporation.

In the Chancery Division on October 12th, before Mr. Justice Russell, mention was made of a case concerning electrical fittings, in which the Attorney-General is opposed to the Mayor and Aldermen of Liverpool.

Mr. Cartwright Sharp, who made an application that his Lordship should fix a day for trial, explained that the case was one in which the Attorney-General in relation to certain taxpayers sought to restrain the Corporation from carrying on a retail business in electrical fittings. One of the defences, it was stated, was that the defendants had been incorporated and constituted a corporation by divers charters, which gave them the right concerning which the issue arose.

His Lordship fixed November 1st for the hearing of the case.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Small Water Powers.

With reference to the letter in your "Correspondence" column this week, from Mr. A. C. Burt, a copy of our booklet "Water Power and the Generation of Electricity" might be of interest to him.

I enclose two copies of the booklet in question, and we shall be pleased to send one to any people who have "water power running to waste."

P. Sylvester Fox,
Sales Manager,
Edmundson's Electricity Corporation, Ltd.

Westminster.
October 15th, 1921.

[The booklet referred to, which has previously been noticed in our columns, gives clear instructions as to methods of measuring the flow of water and the power available, and describes the apparatus used to generate electricity, together with particulars of typical installations carried out by the company.—Eds. Elec. Rev.]

A description of a small plant we fitted up last winter may be of interest, as it differs in several respects from any similar plant that we are acquainted with.

The plant was for a retired physician who had bought a small farm in the Heddon Valley, about half-way between Lynton and Ilfracombe. On the hill behind the house had been cut many years ago a small irrigation ditch; we found that 12 cu. ft. per minute could be depended upon, most of the year, and that we could get a head of 150 ft. with 170 yards of pipe. The owner stipulated that all the waterpower was to be made use of, no accumulators were to be used, and no complicated switchboard or governors were desired.

We laid a 3-in. Mannesmann steel tube from a catch-pit built into the irrigation ditch, down the hill to the outhouses of the farm. A very low-speed dynamo was at that time advertised in your second-hand machinery columns, and was secured; this enabled a direct drive to be arranged, and a

Pelton wheel was designed to run at the same speed as the dynamo, its shaft mounted on ring-oiled bearings for continuous running, and a spare pulley fixed to allow a circular saw to be used for cutting firewood.

The plant has an output of 1.1 kW. In the house there is a 50-gallon hot-water tank, heated with four electric heaters, two of 400 watts, and two of 150 watts; these are controlled by four switches in the kitchen, with a voltmeter over the switches, which constitute the only switchgear, apart from the individual lamp switches.

All through the day the four switches are on, except when the electric kettle or flat iron is in use, when one or two switches are turned off to bring the voltage back to normal, the plugs for these being close by the switches. In the evening, when lights are in use, it is also necessary to turn off some of the water-heating switches; this small amount of attention gives the servant very little trouble, and answers quite well.

The hot-water tank is lagged with about 3 in. of asbestos, and, with the spare electricity, gives all the hot water needed for two baths per day, as well as the hot water needed in the scullery and pantry.

The plant runs continuously, needs very little attention, and even this dry summer has only been "hung up" for want of water two weeks. The Pelton wheel is fitted with interchangeable nozzles so that a larger jet can be used when sawing wood if the supply of water permits.

P. T. Kimmins.

Electricity Works, Lynmouth.
October 15th, 1921.

With regard to Mr. Burt's inquiry under the heading of "Small Waterpowers" in your issue of October 14th, the writer during holidays fixed up a small waterwheel, belt-driving a small dynamo for lighting six lamps in a small cottage. The stream running through the grounds was found to be 30 cu. ft. per minute with a 6-ft. fall. A 12-volt battery was used for storage, and the wheel left running all night. This wheel was not by any means the most efficient, as it was made up roughly from odds and ends lying about the place.

Mr. Burt does not mention the speed of his water; but if it would interest him, I shall be pleased to give him all details of the outfit gratis if he will apply to the Editors for my address.

E. Humphries.

Devon.
October 14th, 1921.

Cleaning Enamelled Slate.

With reference to your correspondent Mr. J. H. Robbords's inquiry in your last issue with regard to cleaning and polishing enamelled slate switchboards, I have found that the following method both cleans and polishes them.

Apply linoleum floor polish with a soft cloth, and polish off with another dry, soft cloth. The greasy streaks can afterwards be eliminated by a final polish with a soft chamois leather.

H. C.

London.
October 16th, 1921.

With reference to your correspondent's inquiry on the above subject, we have found that furniture cream ("Cobra" brand) gives very satisfactory results. The cream should be lightly rubbed over the slate with a clean cloth, and polished with a soft rag or chamois leather. If the cream is unobtainable, the "Cobra" brand black shoe polish makes a very good substitute.

William E. Fuller,
For *The West Leeds Engineering Works.*

Leeds.
October 15th, 1921.

I have found it necessary at times to do a little slate polishing, and find that a good grade of ordinary boot polish applied in a moist state with a soft cloth, and finished off with a piece of velvet, produces a glossy finish equally as good as any new slate.

Another good medium to use is furniture cream, but it is not as good as boot polish, because it is not so searching in its effects.

H. W.

Manchester.
October 16th, 1921.

The Durability of Lead-covered Wiring.

With reference to this subject in your issue of October 14th, 1921, I express the opinion that the practical electrician referred to by "W. T. J." either has considerable stocks of tubing or wood casing in hand which he is anxious to use up, or had very little practical experience with any of the C.M.A. wiring systems.

I would suggest to "W. T. J." ten minutes' practical thinking on the following details:—

1. Compo-lead piping has been used without question for gas lighting for years.
2. The G.P.O. uses plain lead-covered cable which is subjected to more severe conditions without deterioration than would occur in private house wiring.
3. Plain lead-covered e.h.p. mains at 11,000 volts working pressure are in use in this country, and as the least suggestion of moisture penetrating the cover of these cables would be fatal to the service, the conclusions of expert electrical engineers on this subject are obvious.

O. Skidmore.

Wombwell.
October 17th, 1921.

Coventry Corporation and E.P.E.A.

I should like to endorse the statement of "Fair Play," wherein he asked in your last issue if the Secretary of the E.P.E.A. could supply any particulars of the exact position taken up by the Association.

I consider the information is more essential now, as Mr. Jones states that the incident referred to might have culminated in a serious dispute.

As Mr. Jones's reply is distinctly vague and evasive, I can only assume that the dispute was settled in favour of the Coventry Corporation, and I consider it only reasonable that the main facts of the dispute and the decision of the National Joint Board should receive the same publicity as the disputes at Dover and Perth.

One Interested.

Repairing a.c. Rotors.

It is a fairly common experience for a repairer to have an a.c. motor sent in owing to the rotor having rubbed on the stator and so burnt out the windings. Now, assuming that a complete re-wind is called for, is there any method of determining whether or not it is necessary to open out the stator and reinsulate the laminations? Of course, if the air gap has been ground oval, a lot of the teeth knocked out, the vent spaces damaged or any other obvious injury is apparent, the question settles itself, but quite recently a case came to the writer's notice in which a rather large motor had to be rewound owing to its having pulled over. When it was put on load the temperature rise of the iron was so excessive that the motor could not be used, and as a result the stator will have to be rebuilt. The damage to the stampings did not appear to be excessive, at all events a competent firm of repairers did not think it necessary to do anything to them, and as other people may have been up against the same trouble, any information on the subject would be welcome.

Jaques.

London.
October 17th, 1921.

[An obvious plan is to spin the stripped rotor in a suitable magnetic field and see whether it heats excessively.—Eds. Elec. Rev.]

A Motor Problem.

With regard to the motor problem in this week's Review, I doubt the possibility of the motors generating back on to the supply busbars when a "short" occurs on the traction side. In the first place, the motors, being on load, are more likely to slow up, on the voltage drop due to a "short," and it is probably due to that effect and the back e.m.f. set up by the "short" itself causing a rush of current to the motors that the fuses mentioned blew. I have experienced the same thing, and know that the back e.m.f. of a short, where traction is concerned, has no sympathy with motors in parallel with the traction supply source. The best way out of the difficulty is a separate supply for the auxiliary service.

The law of resonance is to be applied in this case where, strictly speaking, a pulsating current is being supplied and a "short" occurs.

P. E. Ford.

Hounslow.
October 17th, 1921.

[Apparently our correspondent refers to the effect of surges.—Eds. Elec. Rev.]

Accumulator Froth.

It seems to be generally acknowledged that this is mainly due to the action of certain chemicals contained in the celluloid. A very simple way out of the difficulty is to do what so many people have already done, that is, to use flexible ebonite containers.

As far as train lighting batteries are concerned, I believe I am right in saying that ebonite is used exclusively. Quite a number of makers of motor-car batteries have adopted ebonite; as far as I know, I am the first person to adopt ebonite for cells of miners' electric safety lamps, but I really don't see why I should be the last.

Theodore Stretton.

Cardiff.
October 14th, 1921.

The remarks contained in Mr. Hesketh's letter published in your current issue call for comment.

On reference to my statement as to transparency, he will find that it was made in answer to his suggestion of "painting with some such preparation as paraffin wax." He now amplifies this suggestion by mentioning transparent paints, the utilisation of which would raise questions of both practical and chemical importance. Mr. Hesketh being so confident as to the variety of methods for overcoming frothing, it naturally causes one to wonder why he did not put one of his "multiplicity of ways" into operation on his celluloid cases instead of abandoning them in favour of glass boxes. To make a suggestion is a simple matter, to put it into practice is an entirely different proposition.

From his remark that the chemistry of frothing should be properly investigated, I assume that this was written without the deliberation one would expect from an apparent authority on accumulators. Does he seriously mean to imply that the accumulator industry, with its facilities for analytical and research work, have not thoroughly and exhaustively investigated this question, and is he not aware that failing glass, ebonite or wood, lead-lined boxes are the alternatives?

His somewhat pointed remarks concerning a Rolls-Royce car call for reply in that so many of your readers will feel it is a matter affecting them personally.

The standard for car starting and lighting batteries is an assembly in ebonite, but should celluloid containers be specifically called for, these could be supplied, but only after advice had been tendered as to the suitability of ebonite cases. Small type cells are supplied in either ebonite or celluloid containers, but the demand is invariably for celluloid, simply because of its transparent qualities.

W. C. Coates.

Ponders End.
October 10th, 1921.

The letters appearing on this have added nothing to our knowledge of the subject. The very best makes of cells do this frothing, and surely if it were possible to employ some other grade of celluloid, no one would risk his trade or reputation. Whatever the cause may be, its elimination should be the job of chemists. Speaking with over 30 years' battery experience, testing and working, I have seen frothing only in cells where the container, envelope containing paste, or separators have been made of celluloid, and this the makers can minimise by leaving as large a space as possible between the top of the plates and the top of the container, with an intervening condensing or settling chamber well ventilated. I have seen plenty of gas bubbling from other types of cells, but no frothing. The effect of frothing is usually to eat away terminals, and on the road with car-lighting batteries this is a nuisance. In 1914 I devised a renewable terminal and tool for affixing it, which received commendation in your "New Devices" column at the time.

B. Barber, A.M.I.E.E.

Oulton Broad.
October 4th, 1921.

The Contractor's Future.

With reference to the above article in your issue of September 16th and subsequent correspondence under this head, this is really a question to be settled by facts, and if instead of using unkind names concerning each other, we were to get busy with the best way of handling our own business, we should accomplish much in the way of establishing the future.

It is a fact there is a market for various labour-saving devices, and there are many such articles of American manufacture carried in stock by large numbers of contractors in almost every large town in this country, and this being so, one would think these articles were purchased for business purposes and not for the sake of the proprietor's health.

Being in business, let us ascertain the best methods to carry on such business, and then get on with it.

C. N. Vernon.

Newcastle-on-Tyne.
October 10th, 1921.

Thunderstorm Phenomena.

During a recent thunderstorm at Alverstoke, Hants., the following phenomena were noted in one of the houses.

The telephone lightning discharger, which was fixed just above the lintel of the side entrance, was blown. The telephone instrument, which was about 6 ft. away across a passage, was not damaged. The occupier of the house, however, was in the open doorway at the time, and, though unhurt, heard a report like a shell burst. The flash was apparently a spark across between the telephone lightning discharger and the electric light distribution box, which was fixed about 3 ft. above the telephone instrument. The glass door of the distribution box was shattered, and some of the fuses were blown, though most were undamaged. Three or four of the metallic filaments in the incandescent lamps in various parts of the house broke. The main house fuses, which were close to the side entrance of the house, were quite unaffected.

The electric light supply is underground, 3-wire, d.c., 240 volts from outer to neutral, and the house wiring is all in screwed conduit. The telephone connection is overhead, the nearest pole, a high one, being about 50 yards distant. The earth wire from the telephone lightning discharger was carried through at least 8 angles of from 90 deg. to 110 deg. as follows:—Round the lintel of the side entrance (2), along the wall (1), round a re-entrant angle in the house (1), then along the side of the house (1), round to the back (1), in through a hole near the lavatory window (2), and thence by a water pipe to earth.

The house is a low semi-detached building about 15 ft. clear of the next pair of houses. The nearest tree is about the same height as the house and in the garden of the next pair of houses quite 20 ft. away from the side entrance.

I wonder if you or any of the readers of your paper can offer an explanation and suggest how a repetition of the accident can be avoided, as the occupier of the house is anxious not to run such a narrow risk of death again unnecessarily.

E. O. Alabaster,
Bvt. Major, R.E., A.M.I.E.E.

School of Electric Lighting,
Stokes Bay, Gosport.
October 10th, 1921.

A Suction-gas Problem.

At a certain small power house in the Midlands we have recently installed a suction-gas plant, and have since had several complaints about the smell given off by it; the complaints seem to originate mostly from people living about 200 yards from the power house, and it is when the plant is idle that they notice it most; yet while the plant is running we who look after it find considerable odours of an objectionable nature from the overflow water from the scrubber, but none at all when the plant is idle.

The water from the scrubber runs through a drain about twelve yards long into an open ditch; but when we put the plant down we built a pit into the drain for deodorising purposes. I should be glad if any of your readers, having had similar trouble, could tell me what is the best deodoriser to use, and whether this method is likely to prove satisfactory with regard to the overflow water from the scrubber.

With regard to the odours arising when the plant is idle, they must come from the waste pipe from the producer, and as far as I can see there is no remedy unless a longer waste pipe would be effective; our present one is 13 ft. above the producer outlet.

O. N. E. Morequery.

October 14th, 1921.

Grinding v. Turning Commutators.

I have read with interest the recent articles in the Electrical Review, on the subject of "Grinding *v.* Turning Commutators," and while I agree that there are certainly good points about each method, I feel I must criticise both the suggestions made.

One correspondent would have us believe that good commutators are manufactured solely by one firm, but of course, any manufacturer of repute can produce machines which give quite as good results as those quoted. This is apparent to users of other makes, who take it quite as an ordinary thing to be able to quote such performances. Indeed, some machines never get the great care that is admitted in this case, and yet give good results. Either method of truing is good, provided it is carried out properly, and it is only in cases where the operator is careless that troubles occur.

Any turner worthy of the name takes sufficient interest in has lathe to keep his "centres" in good condition; indeed it is upon the condition of the centres that all the work produced upon the machine depends. Personally, however, I should not be inclined to allow a "lad in his teens" to true up the shaft and turn the commutator, for the first is an important and not easy task, apart from the care necessary in placing the armature in the lathe.

Grinding is satisfactory provided the correct grade of wheel is used and that all chatter in the parts is eliminated.

The tendency for the copper to "drag" is more apparent when turning than when grinding, because of the difference in the amount taken off relatively by each cut. A grinding wheel will not stand up to a cut more than about 5 "thou" and produce a good finish, and as the finish is the sole reason for performing the operation, a fine cut is taken. The main trouble is the difference in peripheral speed caused by the reduced diameter of the wheel by wear, and therefore a wheel should not be used after its diameter has been considerably reduced.

A manufacturer or user will make use of the method which is best adapted to his plant, and as necessity is the mother of invention, it is quite probable that there are other methods in use. I agree that a good result is obtained by grinding while the armature revolves in its own bearings, but this is hardly practicable in small machines. Personal experience often leads one into a groove, and therefore unless one has proved, by experimenting with all methods, which is the best, one is apt to miss the good points of other methods by being biased.

Adsum.

October 15th, 1921.

Supply Without Statutory Powers.

Should time permit and the Editor have space available in a future issue, I should be pleased to recount my experiences, faced with disadvantages unique and varied in their character. How I made a Provisional Order of the local Council a dead failure may interest "N.W." and others. Your correspondent "A.O.G." gives an interesting example, but although much in agreement with him, I cannot accept the efficiency of the £45 steam set as against a station supplying a million units per annum, or the barrowful of coal, unless it be a two-wheeled barrow. The price to be charged is controversial, but is always worth all costs of generation, and energy should never be sold at a loss to the undertakers. The price has never hindered the progress of electricity, but crass stupidity and "take it or leave it" and "we are the law" has much to answer for. How many supply authorities exercise tact in dealing with the irate and dissatisfied consumer, or employ anyone to create, educate, and keep a satisfied consumer? If there is any such authority it is a *rara avis*.

B. Barber, A.M.I.E.E.

Oulton Broad.
October 4th, 1921.

Rearing Chickens Electrically.

Readers of your note in last week's issue on the above subject might possibly conclude that a modern electrically heated incubator consumes a comparatively large amount of energy.

We should like to say that practically all existing types of oil or gas heated incubators of any egg capacity can be converted to electrical heating, the power consumption of a 50-egg size being only 220 watts, and that of a 300-egg incubator 530 watts.

It will be seen that such incubators would be well within the scope of a country house lighting plant.

Shortly after starting up, the current is switched "off" by the thermostat, and is usually "on" for only an average of 30 minutes out of each hour. The use of four 32-c.p. lamps as a heating medium suggested by Messrs. Cooper & Co. is not only expensive in first cost, but unless the light is well screened, will probably have a detrimental effect upon the later development of the birds. Whilst light is permitted in a hover or "mother," it is certainly to be avoided during the period of incubation.

E. P. Barfield,
Automatic and Electric Furnaces, Ltd.

London,
October 11th, 1921.

Rapid House-Wiring.

We have noticed a claim made in your columns by Messrs. Jessop & Boydell regarding wiring work carried out on the Henley system.

The claim in question seems to have occasioned some criticism, but we really cannot see that this is called for. We are able to say from our own experience in the use of a similar system of more recent introduction (the J. & P. wiring system) that there is nothing unusual in the results said to have been secured; certainly nothing beyond what ought to be realisable by any properly organised contracting business.

We are at present working on housing schemes where two men and a boy are completing in one day the entire installation of a house containing nine lights. This includes the erection of all fittings and shades, which work was not included in the daily output claimed by Messrs. Jessop & Boydell.

We may add that owing to the very favourable results both as regards the costs and workmanship, which we have obtained with the system mentioned, we have completely abandoned the use of screwed conduit for any competitive work.

Henry H. Pearson, A.M.I.E.E.,
Jones Brothers.

Blackpool,
October 13th, 1921.

A.C. Organ Blowers.

Amongst the methods for varying the speeds of organ blowers run from constant-speed a.c. motors, one might consider the system used on motor cycles. This consists of a belt running between two disks which are slightly coned. When the disks are near together, the belt is forced to the outside where the diameter is great, whilst, when the disks are far apart, the belt comes near the centre where the diameter is small. There seems no reason why such an arrangement should not work for organ blowing, the position of the disks being adjusted by a lever running from the bellows. One wants to be sure that there would be no click when the belt joint ran over the pulley, and one also wants to be sure that the motor would not hum unduly. This variable speed arrangement would allow one to run the bellows at a low speed when necessary. Over-blowing could be prevented by arranging that the air valve is opened when the bellows are full. This method would be much better than running the bellows at full speed the whole time, and preventing over-blowing by letting off the air. Such a method is wasteful, as the organ is only very rarely run at full power. It would be interesting to know if anybody has tried such an arrangement.

Organ Blower.

October 17th, 1921.

Lighting Bakers' Ovens.

With regard to the trouble experienced by "Electro" in the lighting of bakers' ovens, I would suggest the use of lamps with platinum loops and spring holders. These lamps would be unaffected by the high temperature. As they are still used in some situations where excessive vibration is experienced, such as gun turrets in battleships, I should imagine they could be obtained without much difficulty.

R. W. J. Stark.

Edinburgh.
October 17th, 1921.

The condition of the equipment, reported by "'Electro" in your issue of October 8th, reminds one of the man who returned from the war "minus a leg and an eye and an arm. Otherwise free from material harm."

I suggest that the problem should be tackled in consultation with manufacturers of watertight fittings, such a fitting to be provided with circulating water by connection to a cistern outside the oven with suitable flow and return pipes; the lamp to be permanently fixed inside the oven. Probable cost, from £5 to £7 per point.

C. A. B.

October 17th, 1921.

Wealth of U.S. Electrical Industry.—Wealth is always of interest and a compilation such as that recently made by Prof. David Friday of the national wealth for 1920 is particularly so. It portrays not only the wealth of the nation but indicates as well the chief sources of this wealth. The total as arrived at by Professor Friday reaches in round figures close to the fabulous sum of $300,000,000,000, approximately half of which is represented by real property subject to taxation. Next in value, the wealth represented by the railroads and their equipment is placed at $20,000,000,000. Segregating and combining certain of the other items as listed, the electrical industry is credited directly with a wealth of $14,200,000,000, but this figure is very far from being complete. Many of the other items given include as wealth electrical equipment, as for example, in manufacturing where the value of electrical equipment employed is known to be some $2,045,975,500. That portion of the wealth of other important industries represented by the value of the electrical equipment employed in each is substantially as follows:—

	$
Agriculture	90,000,000
Electrified steam railroads	135,000,000
Electric railways	330,000,000
Isolated power plants	250,000,000
Fire alarm and signal systems	80,000,000
Contractor-dealers and merchandise ...	176,000,000
Electrical publishing	4,000,000
Miscellaneous	20,000,000
	$1,085,000,000

Combining these further totals a partial aggregate of the wealth contributed by the electrical industry is $17,330,975,000. Even this is far from being all, for no account is taken of the wealth represented by electricity in the marine field, the costly electrically propelled and operated naval vessels, or of the wealth entailed in the equipment for the domestic use of electricity. With approximately 7,000,000 homes wired in the United States, exclusive of Alaska and the islands, each one of which contains from $50 to $100 or much more electrical equipment, it is plain that the electrical industry is directly responsible for a proportion of the national wealth second only to the real property value subject to taxation. Even the value of this property has been materially enhanced by the electrical industry. And a quarter of a century ago there was virtually no electrical industry—at least none which contributed greatly to the national wealth.—American *Electrical Review*.

Electrification of the Polish Petroleum Basin.—The *Journée Industrielle* learns from Warsaw that a group of petroleum companies at Boryslav is to construct a great electric station in order to provide energy for the boring of soundings and working of pumps. The Minister of Industry and Commerce has promised the collaboration of his department for the purpose of creating an electric system for the whole of the petroleum basin.—*Reuter's Trade Service* (Paris).

BUSINESS NOTES.

Bankruptcy Proceedings.—Frederick Charles Nichols, 19, South Street, Scarborough, trading in co-partnership with another, under the style of The Scarborough Motor and Accessories Supply Co., motor and electrical engineer.—The receiving order in this matter was made on September 24th on debtor's own petition. The statement of affairs shows liabilities of £372 and assets of £39, from which has to be deducted £12 for preferential claims, thus leaving a deficiency of £345. The debtor attributes his position to bad trade, lack of working capital, &c. In May, 1914, he started business at 24, Park Street, Scarborough, as an electrical engineer with a cash capital of £120. He carried on the business until May, 1916, when he joined the Army, but after being demobilised in January, 1918, he again opened out business at the same address, and also at Whipp's Yard and Falsgrave, all in Scarborough, when his capital was £150. About two years ago, whilst at Whipp's Yard, the debtor was financed by another, and in July last the business was transferred to South Street, Scarborough. He alleges he first became aware of his failure in November last, when trade was very bad, but it was not until last August that he realised his true position. The first meeting of creditors took place on October 14th at the offices of the Official Receiver.

A. E. Blower (Blower & Cooper), electrical engineers' merchant, 1 and 3, Paul's Bakehouse Court, E.C.—Receiving order made October 11th on debtor's own petition. First meeting, October 25th. Public examination, December 15th, both at Carey Street, W.C.

A. Lord, electrical contractor, 33, Westgate Burnley.—First and final dividend of 7¾d. in the £, payable October 24th, at the Official Receiver's office, 13, Winckley Street, Preston.

C. H. Steel, electrical engineer, 53, Queen Street, Cardiff, and 65, High Street, Merthyr Tydvil.—First and final dividend of 2s. in the £, payable at the Official Receiver's office, 34, Park Place, Cardiff.

A. E. Dickinson (Crown Electrical Co.), electrical engineer and contractor, 157, Hunslet Road, Leeds.—First and final dividend of 11¼d. in the £, payable October 25th at the Official Receiver's office, 24, Bond Street, Leeds.

Ernest Edward Mathers, electrical engineer, of 10, High Street, Doncaster, and residing at Allen Dale, Springwell Lane, Balby.—A receiving order has been made in this case. The statement of affairs shows liabilities expected to rank for dividend amounting to £581 and a deficiency of £498. The assets include a motor cycle and side-car. The causes of failure, as alleged by the debtor, are judgment obtained against him for damages and costs in consequence of a motoring accident, and also insufficient trade. The debtor, aged 36, states that he began business in April, 1921, with £150 capital borrowed from his mother, starting in Doncaster, where he was a stranger, because he was advised by a friend that it was a growing town and there was an opening for an electrical engineer. The debtor says he was unable to obtain orders. He purchased the motor cycle and side-car for £85, in order to canvass outside the town. The accident was on Whit-Monday, at Humphrey Bank, near Harrogate, when a Mr. Samuel Whitaker, of Leeds, was injured and subsequently obtained judgment against debtor for £72 10s. damages and £43 costs. The first meeting of creditors was held recently at the Official Receiver's Offices, Figtree Lane, Sheffield, and the matter was left in the hands of the Official Receiver as trustee.

V. B. Worthington, electrical and mechanical engineer, 33, Memorial Road, Walkden.—First meeting, October 25th, at the Official Receiver's Offices, Byrom Street, Manchester. Public examination, November 9th, at the Court House, Salford.

G. H. Gee, electrician, 10, Front Street, Annfield Plain, Durham.—Last day for proofs for dividend November 8th. Trustee: Mr. C. Wollett, Official Receiver, Pearl Buildings, 4, Northumberland Street, Newcastle-on-Tyne.

Company Liquidations.—Amalgamated Electric Works, Ltd.—By an order of the Court, Mr. T. J. Wilson, of 59-60, Old Bailey, E.C., has been appointed sole liquidator in the place of Mr. J. L. Mahon, retired.

Mutual Electric Trust, Ltd.—Meeting of members called for November 18th at Messrs. Allen West & Co.'s offices, Lewes Road, Brighton, to hear an account of the winding up from the liquidator, Mr. A. E. Wake.

Maxim Lamp Works, Ltd.—In the Company Winding Up Court, on October 18th, Mr. Justice Astbury, on the petition of Carl Quitmann, made a compulsory order for winding up this company. Counsel for the petitioner said he was a judgment creditor. No notice to oppose or support the petition had been received.

Dissolutions of Partnership.—Crosland & Bateson, electrical engineers, Bradford Road, Batley.—Mr. G. F. B. Crosland and Mr. H. D. Bateson have dissolved partnership. Mr. F. B. Crosland will attend to debts.

Smethwick Arc Welding Co., electrical welders, Grove Works, Grove Lane, Smethwick.—Messrs. J. Horton, F. Parkin, G. Price, J. W. Parkin, F. Parkin and H. Jones have dissolved partnership.

Key Electrical Supplies Co., 109-111, Portland Crescent, Leeds.—Mr. J. L. Knowles and Mr. J. Ellison have dissolved partnership. Mr. J. Ellison will attend to debts and continue the business under the same style.

Trade Announcements.—Mr. John Davis states that he has ceased to be connected with the Freeman Electrical Accessories Co., and is commencing business as the Davis Electrical Co., Ltd. (which is being registered), at 6, Warwick Court, High Holborn, W.C.1.

Mr. F. S. J. Harding announces that he has taken over the sole proprietorship of the Swan Electrical Works, Clewer, near Windsor.

Mr. J. W. Russell, electrical engineer, of Loates Lane, Watford, has opened additional showrooms at 8, Queen's Road.

With reference to the notice in our issue of October 7th under the heading of "New Companies Registered," regarding the Baynes Electrical Co., Ltd., in case it may be gathered that the company has started business on the contracting side of the industry, we are asked to state that such is not the case. The company is actually a wholesale electrical supply firm.

The Canadian *Electrical News* (October 1st) contains an article regarding the formation of the English Electric Co., of Canada, Ltd., which is associated with and holds the exclusive manufacturing rights in Canada of the home company of similar title. The company has purchased the plant of the Canadian Crocker-Wheeler Co., of St. Catharines. Mr. R. A. Stinson remains as president and general manager of the new company, and Mr. Gordon F. Perry is chairman of the board.

The Northwood Electric Light & Power Co., Ltd., has removed to new offices at 2, Eastbury Road, Northwood, Middlesex. Telephone number unaltered (Northwood 38).

Messrs. Marley & White have removed to 17, Sandhill, Newcastle-on-Tyne, where they have an office, a showroom, and stores. Telephone number: 1261 Central.

Messrs. T. Twist & Son have removed to their new office and showroom at Britannia Chambers, George Street, St. Helens.

Catalogues and Lists.—Messrs. Lawrence, Reynolds and Co., 13, Crutched Friars, E.C. 3.—A list of electric motors, fuses, charging boards, irons, &c., for which the firm are agents. Also a price list of 1-, 2-, and 3-phase motors ranging from 25 to 200 cycles and from .25 to 45 h.p.

Messrs. Bill & Berry, 18-26, Constitution Hill, Birmingham.—List No. S.R., 1922, an illustrated price list of shunt and speed regulators for generators and motors.

The Hart Accumulator Co., Ltd., Stratford, E. 15.—A showcard advertising "Hart" batteries for motor-car starting, lighting and ignition.

Messrs. Sutcliffe Bros., 90 and 91, Queen Street, E.C. 4.—A price list of v.i.r. cables, flexibles, bell wire, and conduit of various types and sizes.

Messrs. Rayner & Heald, Ltd., Duke Street, Derby.—Stock list of 2- and 3-phase induction motors ranging from 1 to 45 b.h.p.

Messrs. Donovan & Co., 47, Cornwall Street, Birmingham.—A sheet giving illustrations and prices of numerous electrical accessories as lamp-holders, tumbler switches, bells, plugs, house service switches, &c. Also a list of reduced prices of "Mazda" lamps.

Dugdill's Patents, Failsworth, Manchester.—A card bearing numerous illustrations of jointed lighting fittings for walls, ceilings, and desks.

Mr. H. C. Slingsby, 142-146, Old Street, E.C.—List No. 151, dealing with several types of barrows.

Messrs. Hogan & Wardrop, 88, Golden Lane, E.C. 1.—A well-illustrated price list of electric fans of numerous types—desk, bracket, ceiling, port-hole, &c. The list also deals with fractional h.p. motors, regulating resistances, and grinding and polishing machines.

Messrs. Siemens Bros. & Co., Ltd., Caxton House, Westminster, S.W. 1.—Leaflets 2007 and 2009, the first giving a description and illustrations of the lighting of Covent Garden Markets, and the other a list of large residences in which the "Stannos" wiring system has been installed.

Messrs. Watson & Sons (Electro-Medical), Ltd., Sunic House, Parker Street, Kingsway, W.C. 2.—Bulletin 37s, describing the "Canny Ryall" portable diathermy apparatus; priced. Supplement to Bulletin No. 35s, giving altered prices of the "Sunic" X-ray combination. Also a price list (Bulletin 40s) of second-hand X-ray and electro-medical apparatus.

The Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C. 2.—List No. 337, advertising the "Alco" electric washer and wringer.

E.D.A. Activities.—The latest pamphlet of the British Electrical Development Association (E.D.A. 196) sets in contrast the trouble entailed by the use of raw fuel and the advantages of electric heating. Its appearance is attractive and its statements are convincing.

Patent Restoration.—An order has been made for the restoration of patent No. 18,215 of 1915 for "Improvements in or relating to trucks for railway or tramway vehicles" granted to Sidney Thomas and Frank Staits-Gardner.

For Sale.—By order of the liquidator, Messrs. Whitham and Sons will sell by auction on November 8th and 9th at 3, Lisbon Street, Leeds, the stock of Messrs. Hudsons Electrical Engineering Co., Ltd., comprising motors, switchgear, plant, machinery, stores, &c.

By direction of the Disposal Board, Messrs. Lane & Smith will sell by auction on November 1st and following days at Witton, Birmingham, electrical plant and machinery.

The London County Council invites offers for one 3,500-kW generating set.

Assets Auctions Co., Ltd., will sell by auction on October 4th, at 119-121, Newington Causeway, S.E., a quantity of electrical material, &c.

Bristol Corporation Electricity Department invites offers for surplus generating plant, &c. (See our advertisement pages to-day.)

Book Notices.—"Hydro-Electric Power in the Niagara District" (35 pp.). Toronto: The Hydro-Electric Power Commission of Ontario.—This is a well produced brochure, profusely illustrated, dealing with various aspects of the supply of power in the largest of the Commission's systems. It is especially useful as showing the extent to which industry and the general well-being of the district are dependent upon the electricity supply.

"The Metropolitan-Vickers Gazette," Vol. VI, No. 102, September, 1921.—This issue contains an illustrated description of an excess energy meter for measuring consumption above a contract quantity; an article on "High Voltage Bushing Insulators," by W. A. Coates, M.I.E.E.; and "The Story of the Induction Motor," a reprint of a paper read before the American I.E.E.

"The Toronto Hydro-Electric System." Tenth Annual Report, 1920. Published by the Toronto Electric Commissioners.—This gives in detail particulars of operation for the year ended December 31st last, showing very satisfactory results.

"Pitman's Latest Books, Autumn, 1921" (28 pp.).—A catalogue giving sizes, prices, and short descriptions of technical, commercial, and financial books recently published by Sir Isaac Pitman & Sons, Ltd.

"The Mechanical Handling of Goods," by C. H. Woodfield. Pp. xi+116, figs. 73. London: Sir I. Pitman & Sons. Price 2s. 6d. net.

"M. & C. Machine Mining," Vol. I, No. 3. Glasgow: Mavor & Coulson, Ltd. Price 6d.—This contains copious notes on coal-mining machinery and switchgear—their use, upkeep, &c.

"Engineering Abstracts from Current Periodical Literature." Published outside the U.K. New series, No. 9. October, London: The Institution of Civil Engineers.

"Post Office Electrical Engineers' Journal," Vol. 14, part 3. October, 1921. London: Electrical Review, Ltd. Price 2s. net.

"The Electric Furnace," by F. J. Moffett. Pp. x+118; 33 figs. London: Sir I. Pitman & Sons. Price 2s. 6d. net.

"Metric System for Engineers." by C. B. Clapham. Pp. xii+181, 34 tables. London: Chapman & Hall, Ltd. Price 12s. 6d. net.

German Customs Duties.—The German Minister of Finance has issued an order, which took effect on October 20th, increasing from 900 to 1,900 per cent. the premium or "agio" which is leviable when the "gold" duties of the Customs tariff are paid in paper currency. The effect of the order is to double the paper currency duties by requiring 2,000 paper marks to be paid for each 100 marks "gold" duty leviable, instead of 1,000 paper marks as hitherto.

Coventry Corporation and the E.P.E.A.—The trouble between the Coventry Corporation Electricity Department and the E.P.E.A., which had reached so acute a stage that notices of withdrawal of their services had been given by the whole of the staff, has been settled by the Anomalies Committee of the National Joint Board, to which both parties to the dispute agreed to refer it, at the same time agreeing to accept the decision of the Board as binding. We learn from the secretary of the National Joint Board of Employers and Members of Staff, Mr. H. B. Keeping, that the sub-committee met in London under the chairmanship of Alderman Walker, and after a full hearing, decided unanimously that the notices to cease work must be withdrawn and no further attempts made to interfere with the arrangement made by the Coventry Corporation. It was also recommended that the gentleman who had been appointed to the staff of the electricity department should rejoin the E.P.E.A.

New Electrical Manufacturing Works at Leeds.—If example counts for anything in the industrial world, the "merry and bright" spirit of some branches of the electrical trade should do other trades good. It is certainly encouraging when we are all discussing the question of industrial depression and unemployment to see signs of progress and development in any branch of industry, and to note the presence in our midst of those who have sufficient confidence in the future to make preparation for the revival in trade which we all hope will not be long in coming. One such sign is to be found in the building of new works by Messrs. Ingleby & Co., Ltd., dynamo and motor manufacturers, on a site of approximately 10 acres adjoining Old Lane, Beeston, Leeds, which less than two years ago was a field under cultivation. These works, which were formally opened last week by the Lord Mayor of Leeds, consist of two buildings, the larger of which comprises commodious offices and a large machine shop of structural steel arranged for an overhead travelling crane; the other includes a tool shop as well as winding department and stores for finished motors and other materials. The works, which are capable of turning out electric motors for industrial purposes ranging from ¼ b.h.p. to 200 b.h.p., were designed by Mr. J. C. B. Ingleby, elder of the two brothers Ingleby, who commenced business in rented premises in Elland Road in 1908. During the war this became a controlled establishment and supplied a large number of motors to the Government factories. Special attention has been paid in the construction of the buildings to light, ventilation, and heating, and a most important feature is the way the works have been laid out for future extension; one or more bays can readily be added to the main building at comparatively small cost, there being ample land available on the site.

United States Exports of Electrical Goods.—The exports of electrical goods during August were valued at 6,057,489 dollars, as compared with 7,110,285 dollars in the corresponding month of 1920. Seven electric locomotives—not included under general electrical goods—valued at 242,362 dollars were also exported in August. The heaviest decreases compared with the corresponding month of last year were shown in batteries, carbons, fans, heating and cooking apparatus, interior wiring supplies, incandescent lamps, magnetos, spark plugs, &c., and switches and accessories, whereas motors, rheostats and controllers, telephones and transformers, showed healthy increases.—*Reuter's Trade Service* (Washington).

Exports of electrical goods from the United States showed a marked decrease during the first eight months of this year compared with the same period of 1920. This tendency was less noticeable in power equipment than in equipment for motor vehicles and similar lines. In telephones and transformers, however, American trade continues to expand. Japan has been quite an active buyer in many classes of goods, which is a noteworthy circumstance considering the growth of local manufacture.

Russia's Electrical Factories.—The production of the electrical factories in the first four months of 1921 is tabulated as follows in a Russian official journal:—

Goods.	Planned production.	Produced.	Percentage produced compared with programme.
Dynamo machines, motors and transformers	13,420 kW	10,704	80 %
Telephone and telegraph apparatus and parts ...	1,395	1,998	171 %
Wire and cable ...	39,700 poods	36,100 poods	91 %
Electric lamps ...	612,000	297,217	48·5 %
Electric accumulators	12,500 poods	5,100 poods	40·8 %
Insulators, trolleys, &c.	9,621 ,,	3,632 ,,	38 %
Carbons	3,324 ,,	3,938 ,,	120 %

The last two items are for six months.

Under the control of the Moscow Government there are 40 electrical factories, of which 34 are working. These factories are arranged in 28 producing units, under one control, to assure homogeneous production. The total number of workers and staff at the factories was (on January 1st) 7,273 workers, 2,328 employés, total 9,601; on May 1st, 8,426 workers, 2,400 employés, total 10,826. That is to say, the number of workers grew by 16 per cent. in four months, and the employés by 8 per cent. But this increase in labour force was not shown in the working of the factories, which are being run under inefficient conditions. In pre-war days 12,500 men were engaged at the factories, and in 1916 15,000 were employed. The chief problem is labour. Whereas in 1913 55 per cent. of the hands were skilled workmen, on January 1st, 1921, only 35 per cent. were skilled. At the high-pressure factories the ratio of skilled workers fell from 63 to 37 per cent., and those for weak-current apparatus fell from 55 to 26 per cent.

Attracting the Consumer.—The advent of autumn is being accompanied by many fresh efforts on the part of electrical manufacturers to extend the popularity of their products.

The Electric Lamp Manufacturers' Association, through the medium of the Scheff Publicity Organisation, Ltd., has inaugurated a wide campaign to make known the lamps of its member firms. The arrangements are fully set out in a brochure recently issued, and the printing press is to be kept busy.

For the use of its agents, the Edison Swan Electric Co., Ltd., has published a broadsheet which contains illustrations of several advertisements which may be reproduced in local newspapers, the firm supplying the necessary "electros." A new "Ediswan" showcard has been issued. This is a coloured card bearing the title "The World's Light Championship," and depicting a boxer sparring with a "Royal Ediswan" lamp mounted as a punching ball.

The Metropolitan-Vickers Electrical Co., Ltd., is advertising the "Cosmos" radiant fire by means of a coloured show-card depicting two children standing over a fire with obvious enjoyment.

Trade Depression: The F.B.I. Suggestions.—The Executive Committee of the Federation of British Industries has appointed a special committee to consider, and to consult other interests with regard to the suggestions made in its memorandum on trade depression, a copy of which was forwarded to the Prime Minister by Sir W. Peter Rylands, the president. It consists of leading representatives of important industries, and includes the president, Mr. Dudley Docker, Sir R. V. Vassar Smith, Col. O. C. Armstrong, Mr. E. W. Petter, Mr. E. J. Pybus, and others. The memorandum stated that the situation presents two separate problems: (1) The discovery of the best means of alleviating the distress caused by unemployment; (2) the discovery of the best means of reviving trade and thus removing the cause of unemployment. After examining the causes of the present position, the question of restoring stability is reviewed, and it is shown that the cyclical trade depression such as we were accustomed to long before the war will yield to a revival of demand, and of this there are already signs in some trades. The document proceeds to discuss possible measures for alleviating the difficulties of the next few years, such as reduction of taxation, export credit schemes, barter trade, development of Dominions and Crown Colonies, and closes with reference to future competition. We quote the final sentences:—

We have got to realise that if we are to sell goods to an impoverished world we must sell them at a price which that world can afford to pay, and that if foreign labour costs are below ours in any trade, either through their workmen accepting lower rates of remuneration than ours or giving higher efficiency for similar remuneration, no artificial measures will enable us to continue to give employment in that trade. The lowering of the cost of production involves, of course, two factors; the first is the improvement of management, organisation, and plant, and requires time and, above all, the expenditure of capital which war and present taxation and the diminution of the world's capital resources will render it extraordinarily difficult to supply. The second factor is either an increased efficiency of labour in proportion to its remuneration, or decreased remuneration without a decrease in efficiency. The choice before the country is to reach this result either by agreement, which would be infinitely the quickest and most satisfactory to everyone concerned, or by the sheer force of circumstances—continued unemployment, continued distress, and in the ultimate resort starvation for the workman and bankruptcy for the employer.

The Australian E.T.U. and Union Labour.—The Sydney City Council had the following resolution before its meeting in September. It was in the name of the secretary of the Municipal Labour caucus: "That on and from a date to be fixed, all installations which it is intended to connect to the Council's mains must be installed by men who are certified by the secretary of the Electrical Trades Union of Australia, such men to be financial members of that organisation, and the consumers must produce a certificate to that effect before the Council will grant supply. Failure to produce such certificate will render the consumer liable to a fine, and supply of current will be withheld until the fine is paid."

Helium Fittings.—We understand that "Helium" electric light fittings (registered design No. 677,190, of Messrs. Albert Lee & Co., Ltd., New Zealand Avenue, E.C.1) have just been installed in the London School of Economics and Political Science (London University), also in Harrow College and many shops and public buildings. The firm holds the standard type of fitting in stock in various sizes for 60- to 1,000-watt gasfilled lamps.

Producer and Consumer in South Africa.—Every country possesses a national desire to work up its own home-grown material into finished articles of the greatest possible value, rather than to export the raw or semi-manufactured product and re-import it at some later stage of manufacture. This desire was intensified during the war, and in fact was transformed in many instances into a dire necessity. South Africa affords an interesting example of this tendency. In fact, her zeal in some instances outran her discretion, judging by the comparatively high prices at which certain home-produced articles have been selling. This phase of the movement has perhaps influenced the Union Government in creating a department to watch the interests of traders as well as manufacturers.

More than five years have elapsed since a Department of Industry and Science was formed, and during that period it has surveyed the chances of development in almost every possible branch of manufacture in the Union. Exports of South African produce, other than gold, rose in value from £21,419,000 in 1916 to £48,132,000 in 1919 and £42,252,000 in 1920. This advance in export trade has emphasised the need for the formation of a Department of the State which would deal with that branch of activity as well as with industry and manufacture. To fill this want the Union Government has now set up a Board of Trade and Industries whose principal functions will be to advise the Government on the working of the Customs and Excise duties, particularly with reference to the protection of home manufacture, and to examine costs of production, transportation, and labour at home and abroad, in relation to prices of South African and other produce. In short, the Board will endeavour to hold the balance between the manufacturer and consumer. Its duties also include the development of markets overseas for the raw materials and manufactured products of the Union.

The Chilean Railway Electrification Contract.—A report received from Santiago through Reuter's Trade Service referring to the contract awarded by the Chilean Government to the Westinghouse Electric International Co. (see Electrical Review last week) at $7,000,000, states that the bid of approximately $12,000,000 made by the Allgemeine Electricitaets Gesellschaft was the highest of all tenders received. Work on the contract must be commenced within six months and must be completed in the spring of 1923. It is calculated that the cost of electrification of this section of the line will be amortised within six years, on account of the immense saving in fuel and labour.

German Exports to Spain.—During the first seven months of the present year the Germans sent among other goods to Spain over 2,000 tons of electrical installation material out of a total importation of 4,900 tons; over half the telegraph and telephone apparatus imported; more than a third of the fixed steam and gas engines; a third of the flywheels and pumps of all kinds; a third of the hydraulic motors; 40 per cent. of the machines not expressly enumerated in the Customs tariff, and the bulk of the railway material.—*Reuter's Trade Service* (Madrid).

Price of Steel Plates.—North-East Coast steel manufacturers have reduced the price of steel ship plates by 70s. per ton to £10 10s., which compares with £20 10s. at the beginning of the year.—*The Times.*

Contractors and Building Work.—It would seem from the American *Electrical Review* that waiting on the building boom has become a chronic habit with many contractor-dealers on that side of the Atlantic, as well as with the building industry as a whole. Our contemporary adds that the time to wait has gone by, and it is now time for action. Chas. L. Benjamin advises the contractor-dealer to go after fixture renewal business, and he tells how to find it. "Watch for real estate news, and see every man who buys a home." The "Contractors' Column" which we have published in the Electrical Review for many years past is designed to help the British electrical contractor to do this sort of thing. "There have been many thousands of houses changing hands during the last year," says our contemporary.

"When a man buys a house that has been built for 10 years or more there is probably no other fitting or equipment on the property so far out of date as the lighting fixtures. In most cases the new owner gives his property a thorough cleaning out and a new coat of paint and paper, and then those old fixtures look even less appropriate than before. Fixture design has been so changed during the last 10 years, as a result of the passing of gas illumination and the progress in lamp manufacture, that no family can move from a fairly modern apartment into a house with old-time fixtures without feeling a strong desire for a change."

Lord Weir on Measures for Reviving Employment.—Lord Weir has prepared a statement on "The Revival of Employment," and it has been circulated to members of the House of Lords by the Scottish Economic League. It was printed in full in *The Times* of Monday last. The writer says that the choice at the present time seems to be clearly a reversion to longer hours, reduced costs and a revival of employment, or adherence to the short week, vast unemployment, and an inability to support our industrial population. It is not possible for any Government or trade union or any body of employers to guarantee to a body of workers the maintenace of any specific standard of living. "The controlling factor in that is imposed by the workers and their conditions in other countries." Lord Weir makes the following recommendations:—

"(*a*) That we concentrate on reviving employment for workers in their own trades by initiating a demand for the products of these trades.

"(*b*) That we cause this demand by reduction in price and thereby quicken enterprise and give confidence to potential customers.

"(*c*) That we reduce the price by reduction in cost achieved by a revision of the working conditions in industry and deal with wage reductions as a last resort.

"(*d*) That, subject to the trade unions agreeing to this course of action, the Government pledge themselves to use their influence and power to facilitate the granting of credit and the raising of capital for approved schemes and undertakings at home and in our Dominions and Colonies."

Lord Weir delivered an important speech on the situation of the engineering trades and the seriousness of the outlook, at the luncheon held on Wednesday in connection with the conference of the British Engineers' Association.

Electricity Supply Legislation.—Mr. P. A. Harris, at a recent meeting of the London County Council asked whether the delay in the passing into law of the Electricity Bill No. 2 was preventing the operation of the Electricity Act, 1919. Mr. G. H. Hume replied in the affirmative. Communications had recently been addressed to the Prime Minister and the Ministry of Transport calling attention to the important bearing which electrical development had upon the industrial situation generally, with special reference to the unemployment question, and pressing strongly on the Government that the necessary supplementary legislation should be passed by Parliament this year.—*Morning Post.*

Electrical Importers' Criticisms of the Working of the Safeguarding of Industries Act.—The *Evening Standard*, last week, quoted a number of examples of the "widespread dissatisfaction" with the practical working of the Safeguarding of Industries Act. The writer mentions, among other matters, what he describes as the emphatic criticism given by the Secretary of the Electrical Importers' and Traders' Association, who produced a telegram from "a well-known London firm," reading as follows:—"Large consignment lamps awaits dispatch at Rotterdam. Suppliers will not ship as Customs are holding up this side under Key Industries. Position very serious." The Secretary of the E.I. & T.A. is credited with saying:—

"A clause in the Act forbids the free importation of arc lamp carbons, so Customs are actually stopping all pocket batteries, because they contain a piece of carbon 1¼ inches long, and worth about ¾d. This is useless for arc lamp carbon. Worse than this, we have an immense British manufacture of these pocket batteries, but this trade depends on these imported small carbon rods. To-day there are one million carbon rods held up at the docks, and our workmen are kicking their heels in idleness. All this because the arc-lamps clause of the Act defines arc-lamp carbons as necessary for searchlights. The Act never mentioned carbon rods. In any case, our trade is completely dislocated. Further, glass tubing is held up, although it is the raw material for British-made electric lamps. Electric lamps themselves are not included in the Bill, but Customs declare them taxable, inasmuch as they contain a small piece of tungsten wire, worth one penny. The strange thing is that many of these lamps, imported from Holland, are made of British tungsten wire. Customs actually forbid a British product to re-enter its own country!"

The Fancy Goods Section Vigilance Committee of the London Chamber of Commerce has sent a circular letter to Members of Parliament drawing attention to experience of the first two week's operations of the Act. The Act, it states, is being interpreted by the Board of Trade and administered by H.M. Customs in such a way that fancy goods and other traders have passed a resolution expressing 'Grave concern at the very serious dislocation of business created by the Act, particularly on account of the extraordinarily wide interpretations which are being placed by the authorities on certain items referred to in the Key Industries Schedule," and also calling upon the Government to bring in an amending Act "suspending the operations of the Safeguarding of Industries Act in so far as it concerns commodities not produced in this country." In the course of its communication the committee states:—

"*Arc Lamp Carbons.*—It is laid down by the department that under this clause the Customs are entitled to hold up consignments of pocket torch batteries because they contain a minute piece of carbon rod—in spite of the fact that these obviously are not going to be used in connection with arc lamp carbons at all, nor could be. In addition to this a consignment of 600,000 carbon rods wanted by a firm of British dry battery manufacturers has already been held up.

"*Electric Lamps.*—In the Ways and Means debates, Ministers assured the House that half-watt lamps were not to be protected (see "Hansard," *e.g.*, May 31st, col. 940). Yet now electric lamps are held up at all the ports, to be taxed as containing tungsten."

British Trade Mark Applications.—Appended is a summary of the recent applications for British trade marks in respect of goods and productions associated with the electrical trades and industries:—

Titan. No. 409,558. Class 8. Storage batteries and parts thereof.—General Lead Batteries Co., Chapel Street, Newark, New Jersey, U.S.A. November 9th, 1920.

Aerozon. No. 413,561. Class 18. Electric radiators for heating.—Aeronzon Fabrik G. & B. Sternberg, 75 Ritterstrasse, Berlin, Germany. March 18th, 1921.

Aerozohin. No. 413563. Class 18. Electric radiators for heating. Aeronzon Fabrik G. & B. Sternberg, 75, Ritterstrasse, Berlin, Germany. March 18th, 1921.

Bakelaque. No. 416,148. Class 50. Electrical insulating materials in which synthetic resin is the predominating material. Attwater & Sons, Hopwood Street, Mills, Preston. June 15th, 1921.

A.F.A. No. 416,106. Class 8. Electric appliances.—Accumulatorenfabrik Gesellschaft, 3 Askanischer Platz, Berlin, S.W.11. June 13th, 1921.

Cambrite. No. 417,046. Class 8. Electric cables.—W. T. Glover & Co., Ltd., Trafford Park Works, Manchester. July 18th, 1921.

Galvos. No. 417,312. Class 11. An electrical foot battery for medical use.—Elsie Rickards, 1, Weltham Road, Handsworth, Birmingham. July 29th, 1921.

Duraso. No. 417,233. Class 13. Electric incandescent lamps, and their parts, fittings, lamp holders, &c.—Osram Gesellschaft, 1-14 Ehrenbergstrasse, Berlin, O.17. January 23rd, 1921.

Lamp Trade in South America.—According to *Commerce Reports*, American-made electric lamps are meeting with keen competition in South American markets from the German article. Engineers returning from South America state that the quality of the latter is poor, and that a high percentage of those furnished under a recent Government contract gave unsatisfactory length of service.

British Parsimony.—In connection with our criticism of the Government's economical measures in dealing with the Department of Overseas Trade, we observe that the *Daily Telegraph* correspondent at Montreal reports that indignant protests were made at a meeting of the Canadian representatives of British firms exporting to Canada against the manner in which the British Government was curtailing the activities of the British Trade Commissioner's offices in Canada, which had led to the resignation of Captain Edwards, Senior Trade Commissioner, and to sharp reductions of the office staffs. "The meeting was as a farewell to Captain Edwards, when the British trade representatives' organisation resented the curtailment of the work, and declared they had protested to the British Department of Overseas Trade but without avail. A general opinion was expressed that the curtailment was a work of false economy at a time when British trade in Canada is fighting to hold its position against the aggressive campaign of America and other exporting countries. Captain Edwards relinquishes his work as Senior Trade Commissioner, and will shortly return to England."

An American Electrical Man's Impressions in Germany.—Mr. G. C. Du Bois, president of the Western Electric Co. (U.S.A.), recently returned to America after a six weeks' tour of Europe, during which he visited France, Switzerland, Austria, Hungary, Germany, Belgium, and England. The Chicago *Electrical Review* quotes him as saying that "Germany to-day is in a position to undersell the world on most manufactured articles. Industrially, Germany seems to be as efficient as ever. With wages low as measured in the currency of other countries, with highly competent workers eager to produce and with the reparation question in a more settled state, Germany is in a position to go ahead in building up her industries to handle export business. At present she can turn out many lines of manufactured articles to sell profitably for less money than any other country. As nearly as I can calculate it, the cost of German labour in the metal-working trades, measured in dollars, which is the correct way to measure it when it enters into competition with the United States for foreign trade, is about one-sixth of the cost of equivalent labour here. While in all probability this will lead to protective measures on the part of competing countries, such as taxes on German exports and other measures for the encouragement of home industries, yet wages in such countries are now decreasing, and this tendency is likely to continue if it effectively meets German competition in foreign trade."

Hispano-American Electric Co.—According to information received from various sources and published in *Commerce Reports*, the City Council of Buenos Aires has recently agreed to transfer to the Hispano-American Electric Co. the franchise for the supply of electric light and power in the city of Buenos Aires, in succession to the German Trans-Atlantic Electric Co., to which a 50-year franchise had been given in 1907. The Hispano-American Electric Co. was founded in 1920 by the Banks of Madrid, Barcelona, and Bilbao, and has a board of directors made up of some of the most influential men of Spain. The president of the board of directors is Don Claudio Lopez Bru, Marquis of Comillas, and the home offices are at Madrid. While the company is by all indications entirely Spanish in its composition, there have been comments in South America which would indicate a feeling in the Argentine that the German interests have not been entirely eliminated, although on the surface there appears to be no direct evidence to that effect. The various systems taken over by the Hispano-American Electric Co. consist of three plants in Buenos Aires, a light and power plant in Mendoza, lighting and street railway systems in Valparaiso, and an electric street-car line in Montevideo. The German company owned the lighting and railway system in Santiago, Chile, but this was taken over by the Government during the war; it is understood that the new company is making every effort to secure the return of this property as successors of the German corporation. As an indication of the magnitude of the Hispano-American holdings in the Argentine, Chile, and Uruguay, the total capacity of the plants in Buenos Aires alone is at present 125,190 kW, with 66,000 kW in process of installation or on order; the present annual output of the Buenos Aires plants is said to be over 300,000,000 kWh.

D.K. New Club House.—Lady Ellis, wife of the chairman of the English Electric Co., opened the club house equipped for the use of the girl employés of Messrs. Dick, Kerr & Co., on October 12th. Mr. Livingstone, the works manager, presided. The club, corresponding to that established two years ago at Ashton Park for the firm's male employés, as a memorial to comrades who died in the war, is situated in Strand Road. Its programme is to include debating and dramatic societies, classes for dancing, teaching of various crafts and hobbies, and occasional lectures.

Bosch Operations in the United States.—The Robert Bosch Magneto Co., Inc., has just been incorporated under the laws of the State of New York, with a capital of 250,000 dollars. The company claims to have a new Bosch invention for use in the cheaper class of automobiles—a combination battery and ignition system. It will also offer a new Bosch electric lighting system for high-priced cars.—*Reuter's Trade Service* (New York).

The German Cable Industry.—It is stated that negotiations in the German cable industry, to which we referred recently in the matter of insulated conductors, are now proceeding, and are expected to result in the adhesion of the outside makers to the Cable Syndicate.

French Electrical Companies.—A new company has lately been formed in Paris (12, Rue Castex) with a capital of 2,000,000 fr., and the title La Société Hydro-Electrique du Val Vernier, to utilise a waterfall on the river Marne near Gudmont (Haute Marne) for the generation of electrical energy for lighting and power purposes.

LIGHTING AND POWER NOTES.

Belfast.—Committee to Remain.—As an outcome of the special meeting of the City Council, at which the decision to cancel the appointment of Messrs. Preece, Cardew, and Rider as consultants was rescinded, the Electricity Committee, which had tendered its resignation, has agreed to continue in office.

Banff.—Electricity Supply.—A report has been received upon the scheme to introduce electric light and power to Banff and Macduff. Mr. Bell, city electrical engineer, Aberdeen, is consulting engineer. The estimated outlay is £24,000, including suction gas plant for motive power. Overhead cables are to be used.

Bangor.—Bulk Supply.—The Electricity Commissioners have authorised the City electrical engineer to re-open negotiations with the North Wales Power Co., for the supply of electricity in bulk, as they do not consider the circumstances warrant the installation of a 100-kW Diesel set in the borough electricity works.

Barton-on-Humber.—Legal Proceedings.—The Urban Council has been served with a writ by the Barton Electric Supply Co. consequent upon a refusal to enter into negotiations for an increase in the contract price for street lighting. At a specially convened meeting of the Council it was decided to defend the case.—*Yorkshire Post.*

Bedford.—Year's Working.—The accounts of the Electricity Department (engineer: Mr. R. W. Phillips) for the year ended March 31st last show a total revenue of £78,705, as compared with £61,311 in 1919-20. Working expenses amounted to £54,572, as against £43,697, leaving a gross profit of £24,133 (£17,614). The net profit, after payment of all capital charges was £2,139, a slight decline from the previous year's figure—£2,628.

Birmingham.—Unemployment Relief.—Among the unemployment relief measures being taken by the City Council is an instruction to the Electric Supply Committee to commence work on a number of extensions.

New Destructor Works.—The Salvage Committee of the Corporation proposes to construct new destructor works at Witton. A garage for electric vehicles will be installed at the works, and energy is to be generated by means of steam obtained from the burning of refuse. The proposed destructor will consist of eight cells capable of dealing with 38,000 tons of refuse per annum. The estimated cost is £100,000.

Effect of the Coal Strike.—The General Purposes Committee of the City Council has issued a report on the steps taken during the coal strike to ensure fuel and light control. The effect on the finances of the Electricity Supply Department was to involve it in a loss of £43,100. The subsequent and continued effect in loss of business and disorganisation of working it is impossible to assess. The estimated reduction in the sale of electricity during the three months is put at 6.8 million units, of a gross selling value of £59,000, and deducting the cost of producing this extra quantity the loss is £32,400. Extra fuel and labour costs are estimated at £10,700, a total of £43,100.

Bognor.—Increased Charges.—The Electricity Supply Co. has received sanction from the Ministry of Transport to increase its maximum charge for electricity from 8d. to 1s. per unit from October 12th, with a minimum charge equivalent to 15 units per quarter for the winter months and 10 units per quarter for the summer months.

Continental.—Russia.—A Moscow message says that in order to provide a supply of electricity for all the power consumers in the port of Petrograd, a second electrical station will be erected there.

The *Pravda* states that before the war there were 250 electricity works in Russia; now there are 660, of which 189 were constructed during the revolution, and 100 stations in 1920. At present, it is said, stations are being built or extended in 66 towns and 66 villages. Forty-four factories are being electrified, and the systems of electrical distribution are being extended in three Government towns, two districts, and 24 villages.

In the Donetz Basin 37 old stations have been reconstituted into 14 stations, to supply power to the mines, effecting an economy of 320,000 tons of fuel per annum; the superfluous equipment has been removed to other places.

In accordance with the unified plan of electrifying the country the Kashir station for the electrification of the Moscow Government, "the most majestic in Europe," is being built; also the Dniepre of 800,000 kW at the Dniepre weirs; the Shaturskaya; the Utkin factory, of Petrograd; the Kisiloff, in the Ural; the Ivanovo-Vosnesenskaya; the Nishigorod; the Tula; the Volchoff; the Tchelyabinsk, and the Schternskaya stations in the Donetz Basin, all making a total of 1,200,000 kilowatts. How much has actually been accomplished of this grandiose scheme is not known.

Jutland.—The Commission appointed in November last to study the question of utilising the water power of Jutland for the production of electricity has just handed in its report. The Commission examined 16 schemes in connection with Jutland water power, and recommends, subject to further comprehensive investigations on the spot, the establishment of seven power stations; these which would be at Vestbirk, Holstebro, Bur i Ahlersgaard, Skjern, Karlsgaarde, and Ansager, would cost something like 30 million kroner. The Commission considers that these plants could be established with reasonable hopes of profitable results, especially if wages fall.—*Reuter's Trade Service* (Copenhagen).

Austria.—A start has been made with the great Viennese hydro-electric scheme. The Town Council of Vienna, in conjunction with a Vienna Bank Trust, has formed a "water-power works share company" with a share capital of 500,000,000 kronen, half of which the Town Council and the banks will underwrite, some 100,000,000 kronen being subscribed. The company will raise a building capital of ten milliards in special bonds, 3.6 milliards of which will be spent in the first constructive period from November this year to June, 1926, in building the hydro-electric station on the Ybbs, with complementary works. The programme of the second building period is only as yet drafted in the rough, but for the station on the Danube which the Vienna Wasserkraftwerke contemplates undertaking, the raising of 6.4 milliard kronen by the issue of bonds is foreseen. By the carrying out of these plans, some 100,000 h.p. is expected to be placed at the disposal of the Viennese Corporation by the end of 1935 at the latest. While the city participates to the extent of 50 per cent. in the capital of the company and exercises a proportionate influence, it is solely and wholly responsible for the interest on and the redemption of the bonds, as it stands to the company in the relation of its chief consumer. To hasten the works a premium of .12 kronen will be paid for every day saved and every kilowatt available before June 30th, 1928. The existing generating station of the Corporation might produce yearly, with the help of the peat station, 320,000,000 kWh; its actual yield is now 280,000,000 kWh. By the completion of the first part of the building programme, the Corporation works could raise its output by another 100,000,000 kWh, or fully one-third more.

Finland.—As a result of a recommendation made by the State Waterfall Committee, the Council of State decided last May to expropriate the Linnankoski and other lesser falls situated in the Vuoksen for the purpose of a projected State hydro-electric works at Imatra, in connection with the possible conversion of the Finnish railways to electric traction. Appeals made by the Elektro-metallurgical Co. of Ruokolska and the Petrograd Electric Power Transmission Co. for the revocation of the orders for expropriation have been dismissed.

Cookham.—Inquiry.—On October 11th and 12th Col. T. Ekin held an inquiry at Cookham into two applications for Orders for supplying electricity to Cookham and district. The first application was by the Bourne End Electricity Corporation, Ltd., which has an electricity works at Bourne End, and desires to extend its cables to Cookham, through Cookham Dean and Cookham Rise to Marlow, as well as Little Marlow to Wooburn. The second application was made by Mr. George Young and three other promoters of a scheme to supply Cookham village and Cookham Dean and Cookham Rise from turbines driven by Thames water power at Cookham Mill.

Dorchester.—Purchase of Undertaking.—No opposition being apparent to the taking over of the local electricity supply undertaking by the Council, it has been decided to obtain the necessary Order for the purchase.

Edinburgh.—Area of Supply.—The East Lothian County Council recently considered the scheme proposed by Edinburgh Corporation for the extension of the supply from the new station at Portobello. A memorandum, prepared by the County Clerk, pointed out that the ten miles radius agreed to by the Corporation would, roughly speaking, embrace the parishes of Prestonpans, Tranent, Pencaitland, and Ormiston, and perhaps a part of Gladsmuir Parish. It would not seem to be reasonable to allow Edinburgh to take out the best part of the county area without regard to the other part, making it probably impossible in the future to provide for the remainder efficiently and economically. It was understood that the Corporation had under consideration a somewhat wider radius than originally proposed—between 10 and 20 miles. It was unanimously agreed not to oppose the order if Edinburgh was willing to extend the radius of supply to 20 miles.—*Glasgow Herald.*

Electricity Districts.—Local Inquiries.—The Electricity Commissioners give notice that they intend to hold a local inquiry in the Council Chamber at the Council House, Birmingham, on Tuesday, November 15th, at 10.30 a.m., and on the following days, with reference to the proposed South-West Midlands Electricity District,* and to consider schemes in connection therewith that have been submitted by (*a*) the Birmingham Corporation jointly with the Shropshire, Worcestershire & Staffordshire Electric Power Co., and (*b*) the Corporation of Worcester.

A local inquiry will also be held at the Town Hall, Sheffield, on Tuesday, November 29th, at 10.30 a.m., and on following days, with reference to the North-East Midlands Electricity District,* and the scheme which has been submitted by the Corporation of Sheffield for the formation of a Joint Electricity Authority for the area.

Elgin.—Water-power Schemes.—At a recent meeting of the Town Council a committee was appointed to examine and report upon a scheme formulated by the Banff County Council to supply electricity to Morayshire and Banffshire, utilising the power of the river Spey. It was stated that power could be supplied in bulk at 1d. per kWh. The Council had already been invited to participate in a hydro-electric scheme drawn up by the Inverness-shire Council.

Glasgow.—Electricity Charges.—The Corporation is introducing "all electric" houses into its housing schemes as an experiment, and the Electricity Committee has recommended that the following charges, which are based on a "two-part" tariff system, be made, one charge being a weekly standing charge according to the size of the house, and the other charge being the works cost at Dalmarnock of the energy used: 5 apartments, 2s. per week; 4 apartments, 1s. 9d.; 3 apartments, 1s. 6d.; plus ¼d. per unit used in each case.

Gargrave (Yorkshire).—Electricity Supply.—A public meeting was held last week to receive a report on a proposed scheme of electricity supply for the district. Mr. Banks, electrical expert, detailed the scheme, which was to form a Gargrave Electricity Supply Co., to supply energy at 9d. per unit, as compared with the present Keighley (15 miles away) price of 8d. per unit; or at flat rates for varying number of lights. At the rates proposed the public would save about 50 per cent. as against the present gas supply, and the Council believed there would be a saving in street lighting, which the company would undertake, supplying energy and keeping the lamps in order, at £2 per lamp per year. The meeting approved the scheme, and a committee was appointed to work in conjunction with the company.

Hemel Hempstead.—Electricity Supply.—The Town Council has decided to approach the Watford Urban District Council as to the terms on which it would be prepared to supply electricity to the borough.

Holmfirth.—Electricity Supply Extensions.—The Urban District Council has agreed to a scheme of electricity extensions estimated to cost from £400 to £500.

Holsworthy.—Street Lighting.—The Urban Council recently proposed to substitute electric for gas lighting, and applied to the Holsworthy Gas & Electric Supply Co., Ltd., for its terms. The company stated that its plant was already fully loaded, and additions could not be entertained. The Council, refusing to pay the high price for gas lighting, has consequently abandoned public lighting for the coming winter.

Irvinestown (Co. Fermanagh).—Street Lighting.—A Local Government Board inquiry has been held into an application for an installation of public electric lighting.

Kingstown (Co. Dublin).—Street Lighting.—The Urban Council has appointed a committee to consider the introduction of public electric lighting.

Lancaster.—Electricity District.—The Corporation is opposing the scheme for the formation of an area embracing Barrow, Millom, Grasmere, Kendal, Bootle, Ulverston, Carnforth, Morecambe, Lancaster, and Kirkby Lonsdale, with Barrow as the generating station site. It is considered that the proposed area is too scattered, and, having in mind the cost involved in transmission, distribution, &c., it is probable that an alternative scheme, with Lancaster as a centre, will be submitted.

Llandrindod Wells.—Increased Charges.—The Electric Light & Power Co., Ltd., has received sanction to increase its charge for electricity to a maximum of 1s. 2d. per unit, with a minimum for the winter quarter of 17s. 6d. for 15 units or less, for a period of five years.

Proposed Purchase.—The Urban District Council has under consideration a proposal for the purchase of the undertaking provided terms can be arranged.

Llandudno.—Bulk Supply.—The Town Council has approved the draft agreement with the North Wales Power and Traction Co., under which the company will supply electricity in bulk to the Council at 1¼d. per unit, and decided to apply for the Electricity Commissioners' sanction to borrow £15,000, which the Council will lend to the Power Company for the construction of a transmission line from the company's sub-station near Colwyn Bay to the Council's sub-station at Llandudno. The agreement is for twenty-five years, and the erection of the overhead transmission line will be started as soon as possible.—*Liverpool Daily Post.*

Llanfairfechan.—Electricity Supply.—The Urban District Council has decided to proceed with an electric lighting scheme at a cost of £10,000. Negotiations have been in progress with the North Wales Power Co. for the supply of electricity in bulk.

Litherland.—Supply from Bootle.—The Electricity Commissioners have written to the Urban Council with reference to the proposed transfer of the Litherland Electric Lighting Order to the Bootle Corporation. The town clerk of Bootle has been instructed to proceed with the transfer of the Order. Litherland has asked the Bootle Corporation for terms and conditions for the use of electricity for street lighting, and the Corporation has offered to supply electricity at one-third of the rate at which private lighting is supplied, such rate being not less than one penny per unit, subject to the Litherland Council's paying all charges for connections, equipment and maintenance. Work is now proceeding on the laying of mains in the area, and the Bootle electrical engineer reports that the only satisfactory way to provide the capital required for service connections will be for consumers requiring the supply to pay the cost of them.

Liverpool.—Pier Lighting.—The Liverpool engineer has reported to the Tramways and Electricity Committee that the introduction of electric lighting at the Pier Head has proved eminently satisfactory, the lamps giving 50,000 candle power at a cost of £850 per annum.

Loan Sanctioned.—The Electricity Commissioners have sanctioned a loan of £25,290 for mains, sub-station, &c., for the housing estates.

Long Ashton.—Electricity Charges.—The North Somerset Electric Supply Co., Ltd., has fixed the maximum charge for electricity for lighting purposes at 10d. per unit from October 1st.

London.—Fulham.—A reduction in the brilliancy of the electric lighting on October 12th was ascribed by the engineer to a reduction in steam power owing to a condenser having insufficient water. This was said to be due to the prolonged drought which caused the Thames, from which the water is taken, to fall to an extremely low level at ebb tide.

Londonderry.—Electricity Supply Dispute.—The Lighting Committee last week decided to cut off within seven days the electricity supply to the North of Ireland Shipyard Co. and its yard, if an account for £3,264 were not paid. It was stated that the matter had been under discussion for some time, and it was essential that the account should be paid forthwith. The company contended that it had a grievance in respect of delay with regard to a promised extension and its completion, and that it, therefore, had a counterclaim. The question of what further action should be taken was allowed to stand.

Middlesbrough.—Loan Sanctioned.—The Corporation has received sanction to borrow £54,463 in respect of mains, converting plant, gas-engine sets, and building work in connection with the electricity undertaking. An application for sanction to borrow £13,875 for prospective expenditure on mains and services is still under consideration.

Newtown (Mont.).—Electricity Supply.—The Urban Council has appointed a committee to consider a proposal to secure a pumping station and machinery from the Shropshire Union Railway & Canal Co., for the purpose of generating electricity for the town.

New Zealand.—The Arapuni Scheme.—The Arapuni hydro-electric scheme for the initial utilisation of 50,000 h.p., this being ultimately raised to 162,000 h.p., has been finally approved. It is estimated that the scheme will be completed in five years. The total cost is put at £1,879,000, divided among the following items:—Headworks, £1,305,000; transmission, £294,000; and sub-stations, £280,000. Work cannot be commenced until the financial conditions are more favourable, but it is anticipated that the delay will not be a long one. When started full energy will be concentrated on the scheme, other smaller schemes being subordinated to it.

Norden.—Scheme Postponed.—The Urban District Council has adjourned consideration of schemes for the supply of electricity in the Council's area. The proposals provide for the supply by the Rochdale Corporation at a price five per cent. above that charged in the borough, and also for the application for a provisional order and the distribution of electricity by the Council itself.

Northwood.—System of Supply.—The Electric Light and Power Co., Ltd., has now changed over from d.c. to a.c., the systems of supply being as follows: Northwood 240 and 480 V, 50 periods, single-phase. Eastcote 240 and 415 V, 50 periods, 3-phase. The Ruislip supply is to remain as heretofore, viz., 240 and 415 V, 33 periods, 3-phase.

* Elec. Rev., Oct. 1st, 1920; p. 434.

Portsmouth.—Reduced Charges.—The Town Council has decided to reduce the price of electricity for lighting from 8d. to 7½d. per unit, as from the December meter readings.

Radcliffe.—Electricity in Bulk.—The Council is joining the South-East Lancashire Board for the generating of electricity in bulk, and a step in the direction of communal interests has already been taken by the local electricity station being linked up with the Lancashire Power Co.'s works at Outwood and with Bury. The Radcliffe station will probably be used only as a distributing centre.

Rickmansworth.—Electricity Supply.—The Urban Council has appointed a committee to consider the question of an electricity supply for the district.

Sleaford.—Increased Charges.—The Urban Council has increased the price of electricity by 2 per cent., as from October 1st.

South Africa.—Johannesburg.—Mr. Bernard Price, chief engineer to the Victoria Falls and Transvaal Power Co., has replied to the contention that it would take 18 months to obtain an extraneous supply to supplement the electricity generated by the municipal power station, and that it would cost £60,000 for cables, besides transformers. Mr. Price states that adequate relief could be afforded without purchasing additional cables, transformers or other apparatus.

By alterations of the routes of the existing cables and rearranging the transformers already possessed, he contends that an additional supply could be made available in five months, more cheaply than by any other alternative.—*Financial Times.*

Truro.—Electricity Supply.—The Town Council has decided to apply for an order to carry out a proposed electric lighting scheme as public work for the unemployed.

TRAMWAY AND RAILWAY NOTES.

Australia.—N.S.W.—The accounts of the State tramways for the year ended June 30th, 1921, show a total revenue of £3,471,738, as compared with £2,881,797 in the previous year. Working expenses totalled £2,943,252 (£2,486,121), leaving a gross profit of £528,486 (£395,676). After deduction of interest and other capital charges, there was a net surplus of £106,672.

Birmingham.—Effect of the Coal Strike.—The Tramways Committee states that at the commencement of the coal strike the tramway receipts immediately declined to the extent of about £1,000 per week. From May 3rd the services were cut down 25 per cent., with a further consequent decline in the receipts of about £1,000 weekly. From May 22nd to June 29th the services were entirely suspended. Since the termination of the strike the receipts have continued to decline, and are less than the corresponding returns last year by about £5,000 per week. It is estimated that the total loss to the department is at least £70,000.

Bradford.—Tramwaymen's Wages.—Following a recent decision of the Tramways Committee to reduce wages in the parcels department, which is working at a heavy loss, the local branch of the United Vehicle Workers' Union has entered a protest, and contends that the wages are fixed by national agreement.

Liverpool.—Effect of Fare Increases.—At Friday's (October 14th) meeting of the Tramways and Electricity Committee the chairman reported on the effect of the establishment of a twopenny minimum fare on the tramways. During the first nine months of the year there had been an increase in revenue of £52,027, but a decrease of nearly 38,000,000 passengers. The totals were: Receipts, £1,125,522, and passengers 128,898,061. The present system of fares had justified its introduction, and the receipts during the last three months not only covered all operating costs, interest, and sinking fund contributions, but showed a sufficient surplus to pay for renewals. Sufficient experience had been gained with sleeper tracks to indicate that they showed a clear economy both in capital cost and yearly maintenance and upkeep, at the same time providing very much more comfortable riding for passengers. The cost of materials showed reductions, and rails, which last year cost £23 per ton, could now be obtained at £16 per ton.

Rothesay.—Sunday Service.—The Ministry of Transport has written the Town Council stating that complaints have been received that the absence of Sunday cars to Ettrick Bay is injurious to certain sections of the working classes, and has asked the Council to reconsider the question.

Sunderland.—Unfair Competition.—The Town Council has passed the following resolution:—"That in the opinion of this Council the competition of motor vehicles with tramways upon inequitable terms relating to (1) local taxation, (2) road maintenance charges, (3) statutory fares for ordinary passengers and workmen, and (4) regularity of service, will result in further increases in tramway costs and consequential fares. And that representations be made to the Prime Minister, the Minister of Transport, and the M.P.'s for the borough urging the statutory regulation of such competition in the public interest." An attempt to defer consideration of the matter was defeated.

Swansea.—New Cars Purchased.—The Tramways Committee has purchased seven new cars at a cost of £3,045. It is intended to run the smaller cars on the trailer system to cope with the traffic on certain routes.

TELEGRAPH AND TELEPHONE NOTES.

Australia.—Long-range Wireless Telegraphy.—As soon as an opportunity occurs Mr. Hughes will submit to Parliament proposals for Australia to participate in a scheme of direct wireless communication with Great Britain. The *Daily Telegraph* reports that the Cabinet is not unanimous as to the wisdom of spending a quarter of a million when there is a general demand for economy, but the matter will have to be debated in Parliament.

Denmark.—The State network of telegraph and telephone lines in 1919-1920 had an extent of 2,843.2 km. of lines and 63,633.4 km. of wire, with 624 telegraph offices, 83 of which were also telephone offices; 161 telephone offices and 128 wireless stations. There were 733 telegraphic apparatus working, and 4,729 telephone posts, 23 of which were of the Creed pattern.

Mauritius.—Telephone Improvements.—The telephone system, which for a quarter of a century has been run by a single company, is about to be improved. The Chamber of Commerce (in connection with a letter from the Government which asked the Chamber's views regarding certain concessions applied for by the company) has appointed a committee to consider the subject. Important improvements have already been effected by increasing the number of exchanges, but it is now proposed to effect further improvements by affording facilities for connecting private residences in the remote parts of the island with the Port Louis exchange. This will provide a market for a certain quantity of telephone material.—*The Times Trade Supplement.*

Spain.—Improved Wireless Service.—In a few weeks' time a noteworthy improvement will be effected in the wireless telegraph service between Madrid and London. At present it is possible to exchange traffic at certain hours, but delays and irregularities occur. Soon, thanks to new apparatus and a redistribution of the traffic, a continuous exchange of messages between Madrid and London will be inaugurated. For this purpose the station at Aranjuez, near Madrid, which was overloaded, will be set aside for traffic with England and France, while the station at Llobregat, near Barcelona, duly reinforced, will be the centre of reception and distribution of messages from and for Italy, Germany, and Austria, and the new Central European States. An auxiliary station at Madrid, for British traffic, already inaugurated, and one to be inaugurated eventually at Santander, for French traffic, will complete the new system.—*The Times Trade Supplement.*

The French Cable Co. and Wireless Interests.—M. Ernest May, chairman of the Compagnie Francaise des Cables Telegraphiques, addressing the shareholders at the recent annual meeting, stated that, as was known, the company had subscribed for 20,000 shares in the Compagnie Générale de Télégraphie Sans Fil. When the directors became interested in the latter they thought that it would carry on wireless telegraphy between France and the countries served by the cables of the Compagnie Francaise, and that it perhaps would compete with the cables. During the course of the war the Compagnie Francaise asked for authority to establish installations of wireless telegraphy, but the application was refused. The directors, however, obtained an interest of 20 per cent. in the new company, which for the rest was formed under the best auspices. The French Telegraph Administration gave authority to the Compagnie Générale de Télégraphie Sans Fil to establish a station which would in particular communicate with transatlantic countries—those which the Compagnie Francaise serves with its cables—while at the same time imposing upon the former the obligation to constitute a special company for the working of this station. Consequently, in order to participate appropriately in the matter which interested them—that is to say, communication with the North of America and the West Indies—the directors of the cable company were naturally induced to subscribe also 20 per cent. of the capital in the new company. Down to the present time, the first augmentation in the capital of the cable company from 13,000,000 to 16,000,000 fr. and the reserves which had been formed had permitted of the subscription of the shares in the Compagnie Générale, and had also enabled the company to pay the first instalments on the shares of a 20 per cent. participation in the Société Radio-France, which would work the station. But after paying out the dividends to the shareholders in the cable company for the past year, the remaining funds at the disposal of the company would probably not suffice to complete the payments for the shares in the Radio-France. It was, therefore, proposed to convene a special meeting to authorise the direc-

tors to raise additional capital according to needs and up to an amount of 8,000,000 fr., and the conditions of the augmentation would be settled in consultation with the company's bankers.

United States.—The Washington Conference.—The Government has added wireless and cable communications in the Pacific to the list of topics it recently suggested to the Powers for discussion at the forthcoming conference.—*Reuter* (Washington).

Wireless Telegraphy.—Co-operation.—As the result of a wireless telegraph conference which has been sitting in Paris for several weeks and has been attended by representatives of the principal companies of the world, an agreement has been signed which, the *Daily Telegraph* hopes, will materially facilitate operations. The main object which the conference had before it was to organise international wireless telegraphy in accordance with the scientific progress achieved by all the companies. A feature of the agreement and a recognised advantage will be the rational allotment of the length of waves, so as to prevent the disturbance of long-distance communications. In order to organise these communications the discoveries made in the laboratories of the companies will be used in common, and it is confidently expected that this co-operation will ensure an improved commercial service and a quicker Press service at reduced prices. Mr. Owen D. Young, president of the Radio Corporation of America, presided at the conference, the French representatives being M. Gerardeau and Commandant Garnier, of the Compagnie Générale de Télégraphie Sans Fil and of the Compagnie Radio-France. These companies are at present constructing a powerful station at Sainte Assise, which, it is expected, will be able to reach any point in the world.

The *Daily Chronicle* announces that the Gesellschaft fur Drahtlose Telegraphie, of Germany, and Marconi's Wireless Telegraph Co., Ltd., are also concerned in the agreement.

Photographic Reception.—Lecturing on wireless telephony to members of the Dublin Rotary Club on October 17th, Mr. James Smyth, of the General Post Office, said that a Dublin man named McNamara had perfected a machine which could photograph signals and thus obviate the necessity for "listening in."—*Daily Mail.*

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Argentina.—November. State Railways. One year's supply of railway signal material, including telephone and telegraph materials, &c.*

Aylesbury.—November 11th. Town Council. Electric motors and pumps. (See this issue.)

Australia.—Melbourne.—Victorian Government Railways. November 9th. Armature banding machine with electric motor and starting gear (Cont. 34,378).

November 2nd. Electric storage battery complete for automatic telephone exchange (Cont. 34,229).*

January 4th. 150 electric train stops operated by a single-phase induction motor. One set of electrical pyrometer equipment for measuring temperatures of from 350 to 2,000 degrees Fahrenheit.—*Reuter's Trade Service* (Melbourne).

Newcastle (N.S.W).—December 22nd. City Council. One 25-kW motor-generator set. Electrical engineer and manager, Watt Street, Newcastle (N.S.W.).

Cwm (Mon.).—October 31st. Cwm and Tallistown Institute. Renewing the electric lighting installation. The secretary.

Edinburgh.—District Board of Control. Repairs and renewals involving electric fittings at Bangour Village Asylum after military occupation. Mr. R. T. French, clerk, Edinburgh District Board of Control, Castle Terrace, Edinburgh.

Greece.—Athens. November 14th. Telephone installation at Athens, C.B. type, capacity 5,000 local lines, 40 inter-urban lines, and at least 50 special lines connecting Athens with the Piraeus.*

India.—Calcutta.—November 9th. Calcutta Electric Supply Corporation, Ltd. One 15,000-kW turbo-alternator and condensing plant. Two water-tube boilers with an evaporation of 60,000 lb. per hour. (October 7th.)

November 9th. Calcutta Electric Supply Corporation, Ltd. Paper-insulated, lead-covered cables, bitumen-sheathed cables, v.i.r. cables, and joint boxes (Spec. 72). (See this issue.)

London.—L.C.C.—October 24th. Electric goods lift (capacity 30 cwt.) at the Stamford Hill Stores Depôt. (October 7th.)

H.M. Office of Works. October 24th. Electric lamps. (See this issue.)

November 28th. Water-tube boilers, super-heaters and economisers, &c. (See this issue.)

New Zealand.—Wellington.—November 21st. Post and Telegraph Department. 750 red and 750 white switchboard cords, 3 conductor. (Spec. No. 87.)*

Portsmouth.—November 18th. Corporation. Four centrifugal pumps, direct coupled to 3-phase, a.c. motors, sludge pump and motor, and various small motors, switchboard cables, lighting, and other apparatus. (See this issue.)

South Africa.—Johannesburg.—November 7th. Rand Water Board. Two 350-kW steam-driven electrical generating sets, complete with switchboards and all accessories.*

Humansdorp, Cape Province. November 30th. Corporation. One water turbine and dynamo, switchboard with connections, battery of accumulators, and accessories, supply main and public lighting, aerial distributing lines, street lamps, fittings and accessories, section boxes, service cut-outs, meters, &c., ferro-concrete pipe line, reinforced concrete tank, buildings, and foundations. Forms, &c. (63s.) from the town clerk, Humansdorp, Cape Province.

Durban.—Municipal Council. 250 single-pole, or 125 double-pole ironclad fuses, 25 amperes, 200 volts; 500 combined double-pole enclosed switches and fuses, 35 amperes, 200 volts, suitable for house service use; 144 single-pole switch fuses, unmounted, 100 amperes, 200 volts; 50 single-pole switch fuses, of the "Brush" or other similar type, 50 amperes, 2,750 volts, suitable for sub-station use.*

One 3-phase transformer, 25 kVA capacity, 50 cycles.*

Venezuela.—His Excellency Dr. P. C. Dominici, Venezuelan Minister in London (7, Richmond Mansions, Earl's Court, S.W.), has been instructed by his Government to obtain particulars of the price of three portable receiving sets for wireless telephony.

Warrington.—November 15th. Electricity and Tramways Committee. Motors and transformers. (See this issue.)

*** A copy of the specification, &c., can be consulted at the Department of Overseas Trade, 35, Old Queen Street, S.W. 1.**

CLOSED.

Australia.—According to an announcement issued by the Colonial Office the Government of New South Wales has approved the placing with a Lancashire firm of an order (£50,000) for the boilers required to equip the power station of Newcastle, New South Wales.

London.—St. Pancras.—Highways, Sewers and Public Works Committee.

Spare battery equipment for electric vehicle used for house refuse collecting, £347.—Mossay & Co. Ltd., recommended.

L.C.C.—Stores and Contracts Committee. Tender accepted during the three months ended September 30th:—

Electric traction lamps for the Tramways Department (schedule 17b).—Stella Lamp Co., Ltd.

Portsmouth.—Town Council. Accepted:—

Steel work for the boiler house at the electric light station at £525.—Pierson & Co.

Sunderland.—Electricity Committee. Accepted:—

Five single-core l.p. cables.—Pirelli-General Cable Works, Ltd.
2 and 3-core l.p. cable.—British Insulated & Helsby Cables, Ltd.
Compound steel girders for overhead coal gantry.—Dorman, Long & Co., Ltd.

The Town Council has rescinded the resolution instructing the Tramways Committee to purchase British instead of foreign-made rails. The whole matter is to be reinvestigated by the Committee.

St. Annes-on-Sea.—Electricity Department.

Four miles (approximately) armoured cable.—Siemens Bros. & Co., Ltd.

Sheffield.—The lowest tenders for 400 steel tramcar tires for the Corporation were from Continental firms, but the Tramways Committee has accepted the lowest Sheffield tender of £3 12s. per tire, which will mean an expenditure of £475 more on the contract than the acceptance of the Continental tender would have involved. The Continental quotations were £2 8s. 3d. to £2 15s. 6d. per tire, and the Sheffield quotations £3 12s. to £5 1s. per tire.—*Financial Times.*

Royal Air Force.—Recruits Wanted.—The Inspector of Recruiting informs us that there are still a large number of vacancies in this arm of the Service for qualified electrical fitters, power station engineers, stationary engine drivers, shift engineers, and dynamo and switchboard attendants. This appears to be a good opportunity for those who are at present seeking employment, and all particulars will be forwarded by return of post to anyone interested on application to the Inspector of Recruiting, Royal Air Force, 4, Henrietta Street, Covent Garden, W.C. 2. In addition to the above there are a few vacancies for semi-skilled electricians who have a chance to complete their training in the Royal Air Force, and by joining the Electrical Services Works Company recruits are only required to serve for four years.

FORTHCOMING EVENTS.

Electricity Supply Commercial Association (Greater London Division).—Friday, October 21st. At Anderton's Hotel, Fleet Street, E.C. At 7.45 p.m. First annual Bohemian concert.

Birmingham and District Electric Club.—Saturday, October 22nd. At the Grand Hotel. Annual ladies' night.

Institution of Electrical Engineers.—Thursday, November 3rd. At the Institution, Victoria Embankment. At 6 p.m. Presidential address, by Mr. J. S. Highfield.

(North-Eastern Centre).—Monday, October 24th. At the Armstrong College, Newcastle-on-Tyne. At 7.15 p.m. Inaugural address by the Chairman (Prof. W. M. Thornton) on "Engineering Application of Electricity in Gases."

(South Midland Centre, Students' Section).—Tuesday, October 25th. At the University, Birmingham. At 7.30 p.m. Chairman's (Mr. E. Galizia) address; and paper on "Single-phase Commutator Motors," by Mr. N. Elliott.

Northampton Engineering College Engineering Society.—Wednesday, October 26th. At the Northampton Institute (Room 102). At 5.30 p.m. Paper on "Escalators," by Mr. Venables.

Electrical Trades' Benevolent Institution.—Wednesday, October 26th. At the Trocadero Restaurant. At 7.30 p.m. Annual Festival Dinner.

Institution of Mechanical Engineers.—Friday, October 28th. Discussion on the Eleventh Alloys Report.

(Graduates' Section).—Monday, October 24th. At 7 p.m. Paper on "The Efficient Utilisation of Steam and Electric Power in Factories," by Mr. R. E. Light.

Electrical Power Engineers' Association (Southern Division).—Friday, October 28th. At the Central Hall, Westminster, S.W. At 7 p.m. Lecture on "Notes on Surface Condensing Plant." by Mr. J. E. Johnson.

Edinburgh Electrical Society.—Friday, October 28th. At the Philosophical Institute. At 8 p.m. Questions and Answers night.

Junior Institution of Engineers.—Friday, October 28th. Lecturette, "Water Gas Manufacture," by Mr. F. C. Sutton.

Physical Society of London.—Friday, October 28th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary scientific meeting.

NOTES.

Educational.—France.—The authorities of Bordeaux University, anxious to keep abreast of modern requirements, some months ago instituted a special course of instruction in wireless telegraphy, the curriculum followed being the instruction which is necessary for qualification as a wireless telegraphist in the mercantile marine. The first certificates qualifying their holders as electricians and wireless operators have just been distributed, and when the classes are resumed next month a more advanced course will also be given for those desirous of becoming engineers. The wireless operator's certificate automatically qualifies its holder (always, of course, subject to medical examination) for incorporation in the wireless telegraph section of the Army, or a temporary certificate of operation in the Navy and the right of admittance to the naval school at Toulon. The proximity of Bordeaux to the most powerful of the French wireless stations, at la Croix-d'Hins, makes possible practical demonstrations on a large scale.—*Reuter's Trade Service* (Paris).

The late Mr. Frederick Gustav Byng, of 11, Montagu Square, W., who died in July at the age of 27 years, leaving £87,872, left £2,000 to the Provost and Scholars of Oriel College, Oxford, for a scholarship for pupils at Harrow School, and £1,500 for such charitable institutions or objects as the trustees might select.

Appointments Vacant.—Assistant draughtsman (Rs. 350 per month) for the East Indian Railway Co.; junior mains assistant for the Rochdale Corporation electricity works; two or three plumber-jointers for the Manchester Corporation electricity department. (See our advertisement columns.)

Service Notes.—Wireless Men for Aircraft.—Volunteers are required from the wireless branch of the Navy for duty as operators and also as assistants to naval gunnery observer officers in aeroplanes working with the Fleet. Accepted candidates will be required to undergo a course of training in aerial gunnery. Extra pay will be paid to selected ratings at 1s. a day during preliminary training, and thereafter at 2s. a day continuously while detailed for aerial duties, says *The Times*.

Capt. R. B. T. Pinkney has resigned his commission in the Tyne Electrical Engineers, which he held from 1915. He was promoted captain in 1916. Warrant Electrician F. Griffiths has been posted to the battleship *Emperor of India* on recommissioning.

Report of the Electricity Commissioners.—The first annual report of the Electricity Commissioners was issued on Wednesday last (H.M. Stationery Office, price 3s. net). As we receive it at the moment of going to press, we can only mention that up to March last, the total amount of the loans sanctioned by the Commissioners was 15 millions sterling; 536 applications for sanction to loans were received from municipal authorities, of which 432 were granted in full or in part; and 204 out of the 284 undertakings of this class were authorised to carry out extensions.

The report will be dealt with fully in our next issue.

R.N.D. Signal Dinner.—The third annual dinner of the R.N.D. Signal Company will be held at the Engineers' Club, Coventry Street, W.1, on Saturday, November 5th, at 6.30 p.m. Mr. B. Hardie Smith will take the chair. Evening dress will be worn, and tickets, 10s. 6d. each, may be obtained of Mr. A. G. Hilling, 1, Glaserton Road, N.16.

The Electro-Harmonic Society.—On Friday, October 14th, the Society's first concert of the season was given at the Cannon Street Hotel. Sir William Noble, Engineer-in-Chief of the G.P.O., took the chair, and the Great Hall was crowded with members and their guests. The programme was a long one and well varied. Mr. Bernard Flanders, A.R.A.M., presided at the piano, and songs were rendered by Miss Doris Vane (soprano), Mr. Walter Glynne (tenor), and Mr. Charles Tree. Mr. Herbert Collings gave a very lively sleight-of-hand display, and Messrs. Middleton Woods and Norman Long told stories, the latter also executing a few "ideas" upon the piano. Judging by the number present and the way the various items were received, the Society continues in popularity despite the increased subscription.

Cable Guide Award.—The French Academy of Sciences has awarded a navigation prize to M. William Loth for an invention enabling ships to be taken in and out of harbour by means of electromagnetic cable-guides. Admiral Fournier first brought this invention before the notice of the Academy, and it has been adopted by the French Navy after exhaustive trials off Brest. Havre will shortly be equipped with one of the cable-guides, which, it is anticipated, will greatly accelerate the traffic, besides diminishing the risk of accidents.—*Reuter's Trade Service* (Paris).

The Metric System in America.—The annual meeting of the American Metric Association will be held in the King Edward Hotel at Toronto during the morning, afternoon, and evening of Thursday, December 29th, 1921. In August the secretary of this Association visited Montreal and Toronto, and was much encouraged by the preparatory work that had been done in the interest of the metric movement in Canada. It was pointed out that the old United States measures of capacity, which differed by more than 20 per cent. from the Canadian measures having the same names, were illegal in Canada, and the Canadian measures for liquids were illegal in the United States; while the metric measures are legal for all transactions in all countries. He found many of the leading officials and business men heartily in favour of making the change to the more convenient metric method of measuring as soon as it could be expeditiously made.

The object of the meeting on December 29th is to bring together public officials, engineers, business men, and others who are interested in securing for the United States and Canada the benefits of the general use of this system, and to utilise the information thus gained in guiding the metric movement. As far as possible, the papers to be presented at the coming meeting will outline the steps necessary for the change in the industries and government. The Britten-Ladd Metric Bill now before the United States Congress will be among the subjects discussed. The policy of the American Metric Association is to bring out the desired facts for the benefit of all concerned. Suggestions and questions should be sent to the American Metric Association, 156, Fifth Avenue, New York City.

Power from Boston Water Supply.—Nearly 16,000,000 kWh was delivered in 1920 to the interconnected systems of the Edison Electric Illuminating Co. of Boston and the New England Power Co. by the Wachusett and Sudbury hydro-electric plants of the Metropolitan District Commission as a by-product of the Boston water supply. The Wachusett station, situated at Clinton, Mass., receives water from the Wachusett reservoir under a head of 96 ft., and after passing it through four 1,000-kVA water-wheels discharges it into a tunnel feeding the metropolitan area. Similarly, the Sudbury station, operating under a head of 65 ft., with a plant rating of 1,450 kVA, discharges water into the Boston supply. Last year the Wachusett station delivered 7,474,485 kWh to the two companies, and from Sudbury the Edison Co. took 6,382,831 kWh. The Boston Edison-New England Power 66,000-volt tie line enables the plants to be interconnected when desirable, and has resulted in a much larger sale of energy to these utilities than would otherwise have taken place. In eight years $500,000 worth of by-product energy has been sold from the Boston water supply to these utilities and for pumping.—*Electrical World*.

The Business Aspects of Electricity Supply.—Mr. H. Richardson, Corporation electrical engineer, Dundee, addressing members of the Rotary Club on the modern business aspects of electrical power supply, made interesting comparisons between Great Britain and other countries, notably America and the Continent, showing that the consumption per head of the population was very low in this country, although British prices compared favourably with American and Continental charges. He advocated that municipalities should set aside funds for experiment, and should encourage and reward initiative and invention in the same manner as electricity supply companies. In the business of power supply there should be mutual confidence between private enterprise and municipal enterprise, because their objects were identical and both had done well by the public.

The Electrical Trades Benevolent Institution.—At the annual Festival which is to be held next Wednesday, Sir Tom Callender will preside, and it is hoped that there will be a record attendance. On this occasion ladies are invited, for the first time, an innovation which should greatly enhance the attractions of the Festival, and, we hope, will ensure a satisfactory report on its financial result.

Resignation of Sir Eric Geddes.—It is announced that Sir Eric Geddes has resigned the position of Minister of Transport. Until the future of the department has been settled Mr. Neal, the Parliamentary Under-Secretary, will be in charge.

INSTITUTION NOTES.

P.O. Telephone and Telegraph Society of London.—Mr. F. J. Brown, C.B.E., chairman, lectured to members of the Society at the first meeting of the winter session that was held on October 17th at the Institution of Electrical Engineers, and during the course of his remarks, said, according to the *Daily Telegraph*, that the Imperial wireless scheme that had been adopted by the Government had been criticised on two grounds. First, it was contended that direct communication should have been established with India; and that communication with Australia should have been either direct or through a single intermediate station only. In the judgment of the best experts, however, the shorter stages were preferable on all grounds, and especially on those of reliability and cheapness, although the stations contemplated would be able to communicate direct between England and Australia for an average of two hours daily, and between England and India for a longer period. The second point of criticism was that the stations would be State-owned. It was urged that the scheme should have been left to private enterprise, which was so successful in establishing cable communication. But there was a very important point of difference. Owing to the comparatively few wave-lengths available for long-distance wireless communication, and the mutual interference between stations, the Imperial scheme, whoever owned it, had to be a practical monopoly; and it was clearly preferable that a monopoly should be in the hands of the State. This did not apply to cables, which did not interfere physically with one another.

Keighley Association of Engineers.—The first lecture of the season under the auspices of the Association was given on October 8th by Mr. W. M. Selvey, of Sheffield, who spoke on "The Heat Balance of an Electrical Power Station." Mr. Robert Hudson (president) occupied the chair.—*Yorkshire Observer.*

South Wales Institute of Engineers.—An exhibition of fuel-saving appliances and methods is to be held at the Institution, Cardiff, on November 17th. During the exhibition Mr. David Brownlie will read a paper on "Boiler-house Management."

West of Scotland Mining Electrical Engineers.—At the opening meeting of the session, held on October 15th, it was reported that the combined membership was 322. Mr. T. J. Jamieson Lenzie, president, in his address, dealt with the proposals for the standardisation of plugs in connection with coal cutters.

Barrow and District Association of Engineers.—At the opening meeting of the autumn session of the Association on October 14th last, the new president, Mr. J. Callander, M.I.M.E., M.I.N.A., delivered an address on "The Development of Marine Propulsion as Affected by the Introduction of the Turbine." After carefully tracing the development of marine turbines up to the adoption of wheel gearing, Mr. Callander said that two other methods of speed reduction called for comment, namely, electrical and hydraulic transmission. With electrical transmission the turbine could be run at full speed under all conditions, and left in charge of the governor; the reduction ratio could be varied indefinitely. In warships, where a high power was installed and the ship was run for 90 per cent. of its life at 10 per cent. or even 5 per cent. of full power, the advantage was substantial. In the mercantile marine the time during which a ship was under way at anything but full power was negligible, and the advantage claimed had little foundation.

The Institute of Physics.—The new Board of this Institute is constituted as follows:—

President: Sir J. J. Thomson, O.M., F.R.S.

Past-President: Sir Richard Glazebrook, K.C.B., F.R.S.

Vice-Presidents: Prof. W. H. Eccles, F.R.S., Prof. C. H. Lees, F.R.S., Major E. O. Henrici, R.E., C. C. Paterson, O.B.E.

Treasurer: Sir Robert Hadfield, Bart., F.R.S.

Honorary Secretary: Prof. Alfred W. Porter, F.R.S.

Non-Official Members of Board: Inst. Comm. T. Y. Baker, R.N., J. E. Barnard, Dr. R. S. Clay, W. R. Cooper, Prof. C. L. Fortescue, O.B.E., Prof. Andrew Gray, Dr. G. W. C. Kaye, Sir Charles Parsons, K.C.B., F.R.S., C. E. S. Phillips, O.B.E., Dr. E. H. Rayner, Prof. S. Russ, F. E. Smith, O.B.E., F.R.S., Sir Napier Shaw, F.R.S., R. S. Whipple.

Particulars relating to the Institute can be obtained from the Secretary, Mr. F. S. Spiers, O.B.E., 10, Essex Street, London, W.C.2.

Institution of Electrical Engineers.—The first meeting of the new session will be held at the Institution building on Thursday, November 3rd, at 6 p.m., when Mr. J. S. Highfield will deliver his presidential address.

North-Eastern Centre.—The opening meeting will be held at the Armstrong College on Monday, October 24th, 1921, at 7.15 p.m., when the chairman, Prof. W. M. Thornton, will give his inaugural address, entitled "Engineering Application of Electricity in Gases."

South Midland Centre.—*Students' Section.*—A successful smoking concert was held on October 11th at the Grand Hotel, Birmingham. The University Glee Party rendered a number of items. At the opening meeting of the session on October 25th, Mr. E. Gallizia will deliver his address as chairman, and a paper on "Single-phase Commutator Motors" will be read by Mr. N. Elliot.

Birkbeck College (University of London).—Mr. L. Bolton, winner of the £1,000 prize offered by *The Scientific American* for the best essay on Einstein's theory, will give two lectures on "Relativity" at Birkbeck College, Fetter Lane, E.C. 4, on Mondays, October 24th and 31st, at 5.30 p.m. Admission is free, without ticket.

Wireless Telegraphy.—Prof. R. Widdington, D.Sc., of Leeds University, lectured at the Grand Hall, on the Scarborough Spa, last week, on "The How and Why of Modern Wireless." The professor illustrated his remarks by demonstrations in wireless telegraphy and telephony, including the transmission of a gramophone rendering of "O Star of Eve" (*Tannhauser*). Mr. E. R. Cross presided.

The annual meeting of the Leeds Amateur Wireless Society took place at the Leeds University on October 14th, when it was decided that an exhibition should be held shortly, at which it is hoped to have the support of the University staff.

Mr. Thos. F. Finucane was the lecturer, last week, at the Leeds Institute, his subject being "The Romance of Wireless." The speaker did not doubt that ten years hence wireless telephony would be a commercial proposition. In the course of his lecture and demonstration the members of the audience were enabled to hear music being played at Wakefield and transmitted by wireless telephony. The lecturer also showed a kinematograph film illustrating the wireless equipment of a Handley-Page aeroplane flying between London and Brussels, in which the airmen were given their direction by means of the Marconi direction finder. He instanced the passing of direction to ships at sea by wireless, the device which ensured that the S.O.S. signal would not be missed even if the operator were absent, and other important developments.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the comercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

The Times states that, from a large number of candidates, Glasgow University Court, on Monday, selected Dr. G. W. O. Howe to be the first occupant of the newly-founded James Watt Chair of Electrical Engineering. Dr. Howe, who is 45 years of age, is at present head of the Department of Electrical Standards and Measurements at the National Physical Laboratory. We tender him our hearty congratulations on his appointment.

It is interesting to hear that Mr. R. Borlase Matthews, Wh.Ex., M.I.E.E., &c., has been asked to read a paper before the Royal Dutch Institute of Engineers at Nijmegen (Netherlands), and he is doing so to-day (October 21st) on the subject of the application of electricity to farming. As some of our readers are aware, Mr. Matthews has devoted considerable attention to this matter in recent years, and has carried out considerable experimental work on a commercial scale (*i.e.*, on an entirely different basis to laboratory or college practice) on his 600-acre farm at Greater Felcourt, East Grinstead.

On October 13th the marriage took place at All Saints' Church, Maidstone, of Mr. Stanley Wilson, of the Western Electric Co., and late of Luton Corporation, to Barbara Jessie, youngest daughter of Mr. Fred. J. Oliver, J.P., of Maidstone.

We learn that Mr. R. Thomsen has obtained the appointment of station superintendent to the Coventry Corporation Electricity Department. He took up his duties on October 1st. There was a large number of applicants. Mr. Thomsen was previously resident engineer at the Thornhill power station of the Yorkshire Electric Power Co.

Mr. W. T. Day, of *The Pioneer and Civil and Military Gazette*, Ltd., 11, Arundel Street, Strand, London, W.C. 2, is leaving England on November 11th for a trade investigation tour throughout India, calling at Bombay, Allahabad, Delhi, Lahore, Karachi, Calcutta, Cawnpore, Madras, &c. His services are at the disposal of readers desiring special information with a view to appointing agents.

We regret to read in the Sheffield papers that Sir Robert Hadfield has this week undergone an operation in a nursing home in London. We are glad to hear that the operation was successful.

A large photograph of the Dover Corporation tramway staff has been presented to the manager, Mr. E. H. Bond, as a token of esteem.

Mr. H. Wilson, for 15 years mains superintendent at the Maidstone Corporation Electricity Works, who is leaving to become distribution engineer to the Croydon Corporation, has been presented by the electricity works staff with an arm-

chair and by townspeople with a pair of field glasses, a smokers' cabinet, and a case of fish knives and forks. Mr. Hoadley, the chief engineer, presided, and made the presentation.

Mr. David Thomson was presented by the employés of Ayr Corporation Electricity Department with a gold watch on the occasion of his retirement after 26 years' service.

An apprentice electrician, James McKee (19), residing at 61, Ure Street, Govan, has been publicly presented with the parchment certificate of the Royal Humane Society for life saving. He rescued two boys from drowning in the Clyde at Harland & Wolff's shipyard.

Mr. A. C. Welbourne, assistant engineer at Barton-on-Humber electricity works, has been appointed assistant electrical engineer to the Holmfirth (Yorkshire) District Council.

Mr. Francis H. Page has taken up the position of London and district representative for Messrs. Marshall & Plumtree, 20, High Holborn, W.C. 2. He was previously with Messrs. H. W. Smith & Co., Ltd., at their Kingsway office.

The Guildford Corporation having acquired the undertaking of the Guildford Electricity Supply Co., Ltd., Mr. H. L. Alderton is no longer connected with the management, his place being taken by Mr. G. W. Spencer Hawes (of Messrs. May & Hawes, the consulting engineers to the Corporation). Mr. Affleck, Mr. Alderton's assistant, has been appointed works engineer. Communications for Mr. Alderton should be addressed to "St. Ronans," Woodbridge Road, Guildford.

Mr. G. T. Milne, H.M. Trade Commissioner at headquarters, who recently returned to this country from South Africa, where he acted as Senior Trade Commissioner in the absence of Mr. Wickham, who is on an official visit to this country, has now been appointed to the post of H.M. Senior Trade Commissioner in Canada and Newfoundland, in succession to Capt. Edwards, resigned. Mr. Milne was to leave on October 19th to take up his duties at Montreal.

We are not surprised to read in the *Bulletin* of the Federation of British Industries that the report of the Finance Committee that Mr. Edmund L. Hill had resigned his position as general secretary of the Federation was received with great regret. The committee expressed their recognition of the inestimable services of Mr. Hill since the earliest days of the Federation's history in building up the membership and organisation of the group and district systems, and wished him success in his new sphere of activities. It has been decided to abolish the post of general secretary and divide up the work among various departments. Mr. D. L. Walker has been appointed secretary of the Federation, to deal with the purely secretarial work.

Obituary.—Mr. James Fielding.—We regret to record the death of Mr. Alderman James Fielding, joint managing director of Messrs. Fielding & Platt, Ltd., engineers, of Gloucester, in his 75th year.

Mr. H. Laws.—We regret to record the death of Mr. H. Laws, collector in the Ilford Council's Electricity Department. While out cycling he was injured in a collision with a motor car, and died in hospital.

Mr. E. R. Simmonds.—The death took place on October 8th, at the age of 43 years, of Mr. E. R. Simmonds, originally a partner in the firm of Allen & Simmonds, electrical engineers, of Reading.

Mr. W. E. Mandelick.—We regret to read in *The Times* that the death has occurred in Berlin, after an operation, of Mr. William Edward Mandelick, of London, formerly secretary and business manager of the London General Omnibus Co. and secretary of the London electric tube railways.

NEW COMPANIES REGISTERED.

Moore & Barker, Ltd. (177,243).—Private company. Registered October 13th. Capital, £1,500 in £1 shares (1,300 preference). To take over the business of dealers in electrical goods carried on at 13, North John Street, Liverpool, as Moore & Barker. The first directors are: E. G. Moore, Tetherdown, Jubilee Road, Formby, dealer in electrical goods. R. J. Barker, 24, Chestnut Grove, Birkenhead, dealer in electrical goods. Solicitors: Rigby & Herron, 8, Sweeting Street, Liverpool.

Cinema Engineering Co., Ltd. (177,248).—Private company. Registered October 13th. Capital, £5,000 in £1 shares. To take over the business of a kinematograph and electrical engineer carried on by E. S. Macfie as the "Cinema Engineering Co.," at 45, Cannon Street, Manchester. The first directors are: E. S. Macfie (permanent), "Burwood," Lynton Road, Heaton Moor, Stockport; F. H. Judge, 31, Henrietta Street, Old Trafford, Manchester. Qualification: £100. Secretary: E. S. Macfie. Solicitor: F. C. Webb, 16, Daneshill, Potefield, Prestwich.

Edward Dewhurst, Ltd. (177,199).—Private company. Registered October 10th. Capital, £20,000 in £1 shares. To carry on the business of electrical and mechanical engineers as formerly carried on by the late E. Dewhurst at 14-26, Mount Street and in Theatre Street, Preston, and to adopt an agreement with Mrs. C. M. Dewhurst, E. G. Dewhurst, J. C. Rhodes, Mary Dewhurst, R. A. Dewhurst, Constance Dewhurst, A. A. S. Roscoe, J. E. Eaves, A. Ashcroft, J. Chadderton, and R. Swindlehurst. The first directors are: J. C. Rhodes, 15, Alfred Street, Preston; E. G. Dewhurst, Lindon House, Higher Bank Road, Fulwood, near Preston; R. A. Dewhurst, Lindon House, Higher Bank Road, Fulwood, near Preston; A. A. S. Roscoe, 2, East View, Ribbleton, Preston; J. E. Eaves, 14, Manor Avenue, Fulwood, near Preston (all permanent, subject to holding 300 ordinary shares). Secretary: Constance Dewhurst. Registered office: 16, Mount Street, Preston.

Hampstead Electrical Co., Ltd. (177,252).—Private company. Registered October 13th. Capital, £1,000 in £1 shares. To carry on the business of electrical and general engineers and contractors, gasfitters, builders, plumbers, consulting engineers, &c. The subscribers (each with one share) are: R. G. Brand, 80, Westbere Road, Cricklewood, N.W., merchant; W. N. Walters, 355, Finchley Road, Hampstead, N.W., engineer. The first directors are not named. Registered office: 355, Finchley Road, Hampstead, N.W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

R. A. Evans, Ltd.—Mortgage dated October 3rd, 1921, to secure £3,500, charged on certain lands and premises in Leicester. Holder: Leicester Permanent Building Society.

Muirhead & Co., Ltd.—Satisfaction in full on September 30th, 1921, of debentures dated November 16th, 1904, securing £8,000.

Twiss Electric Transmission, Ltd.—Particulars of £12,000 debentures authorised September 6th, 1921; present issue £6,000, charged on the company's undertaking and property, present and future, including uncalled capital.

Catchpole & Maurice, Ltd.—Particulars of £1,000 debentures authorised by resolutions of September 15th and October 5th, 1921; present issue £500, charged on company's property, present and future, including uncalled capital.

Crowther & Osborn, Ltd.—Debenture dated September 29th, 1921, to secure not more than £20,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: O. W. Porritt, Tor Side, Helm Shore, Lancs.

British Universal Variable Gears, Ltd.—G. M. Brown, of 17, Grosvenor Gardens, S.W., appointed receiver on October 5th, under powers contained in debentures dated May 31st and June 4th, 1921.

CITY NOTES.

Auckland Electric Tramways Co., Ltd.

The directors, in their report for the year ended June, 1921, state that since the last report £154,800 of the 5½ per cent. debentures received from the Auckland Corporation in payment of the purchase money for the undertaking have been sold at an average price of £90½ per cent., the sales to date thus amounting to £272,500. £100,624 of the company's first mortgage debenture stock was bought and cancelled, the average cost to the company being approximately £90½ per cent. The revenue for the year, derived mainly from interest upon the City of Auckland Corporation debentures, amounted to £62,981. After providing for all expenses chargeable to revenue, including £14,599 for debenture interest, there is a balance on revenue account of £31,506, making, with £9,610 brought forward, £41,116. The dividend on the preference shares to June 30th last requires £9,000, and a dividend is recommended on the ordinary shares at the rate of 5½ per cent. for the year (free of income tax), requiring £23,625, and leaving £8,491 to be carried forward. Meeting: London, October 24th.

French Companies.

The Société d'Appareillage Electrique Grivolas has decided to pay no dividend for 1920 as the net profits only amounted to 62,000 fr., as compared with 982,000 fr. in the preceding year.

The *Société Construction Electrique*, at the annual meeting held at Lyons on October 12th, decided to pay a dividend at the rate of 12.50 fr. gross per share for 1920, as compared with 11 fr. in the previous year. The net profits in 1920 amounted to 552,000 fr.

The directors of the *Maison Breguet* report net profits of 1,740,000 fr. for 1920-21, compared with 1,605,000 fr. in the preceding year, when a dividend at the rate of 50 fr. per share was paid on capital of 4,000,000 fr. The rate of distribution for 1920-21 has not yet been fixed, the share capital in the meantime having been increased to 8,000,000 fr. At the end of the year the sum of 6,388,000 fr. had been expended on the restoration of the works at Douai, where the Germans wrought destruction and removed plant.

Norwich Electric Tramways Co.

The report which is to be presented at the annual meeting in London on November 28th gives the following comparative figures for the past two years:—

	1920.	1921.	
Total receipts ...	£72,463	£79,814	Inc. £7,351
Total expenditure ...	£61,600	£75,881	Inc. £14,280
Net profit ...	£10,863	£3,933	Dec. £6,929

The amounts for expenditure include debenture interest, donations, and London expenses.

	1920.	1921.
Car-miles run	947,448	943,423
Passengers carried	14,671,084	12,856,372
Earnings per car-mile	18·36d.	20·30d.
Expenses per car-mile	14·94d.	18·63d.
Earnings per passenger	1·16d.	1·47d.

The net profit for the year was £3,934, which is to be transferred to the reserve fund. The revenue account shows a total income of £79,247. Traffic receipts amounted to £78,504.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted:—

Pernambuco Tramways & Power Co.—Partly-paid scrip for £335,400 8 per cent. prior lien debentures of £100 each (bearer).

Drake & Gorham, Ltd.—The directors report that the net profit for the year ended June 30th, 1921, is £13,433, after payment of all charges, including bonuses due to staff, interest paid and accrued on seven-year notes, interest on loan, writing off expenses in connection with issue of notes and loan, and making provision for contingencies. Including £12,235 brought forward there is a total of £25,668, which it is proposed to appropriate as follows: Dividend at the rate of 6 per cent. for the year, £7,500; by writing down goodwill, £5,000; by reserve for E.P.D. and corporation profits tax, say, £7,400; carrying forward £5,768. Although the results in the earlier part of the financial year were satisfactory they were adversely affected during the later months by general trade depression and the electricians' and coal strikes. In December an issue of £50,000 10 per cent. seven-year notes was made, the amount being largely over-subscribed. A loan of £12,000 has also been secured on the lease of the head offices. The capital thus provided was essential for the conduct of the business then in hand, but owing to the reduction in turnover which has since taken place the directors are considering the advisability of extending the sphere of the company's operations in other directions. Annual meeting: October 27th, London.

Associated Fire Alarms, Ltd.—The profit for the year ended June, 1921 (after reserving £1,082 for income tax and corporation profits tax) amounts to £3,126, as compared with £2,312 last year. Adding last year's balance of £3,842, the balance at the credit of the profit and loss account amounts to £6,968, the whole of which it is proposed to carry forward. We understand that the company has several important contracts in hand for the protection of premises by its automatic fire alarms, including the Air Ministry depôts at Ruislip and Milton; Dickins & Jones's new building in Regent Street; Peter Robinson's new building in Oxford Street; Selfridge's new building in Oxford Street, and the Three Counties Mental Hospital in Bedfordshire.

Amalgamated Wireless (Australasia), Ltd.—On its trading activities during the year ended June 30th last, this company made a profit of £9,775, or £928 more than in 1919-20. In their report on the company's operations in 1920-21, the directors state that ships' wireless business was very satisfactory, although it suffered by reason of shipping strike disorganisation. Wireless patents of considerable value are stated to have been added to those owned by the company, and an experimental station has been erected in Victoria. The company's general electrical business, which traded as the Australectric Co., is reported to have extended so rapidly that it became expedient to form it into a separate limited liability company. That was done in April last, the "parent" company retaining the entire interest.

Automatic Telephones (Australasia), Ltd.—This company earned a net profit of £6,018 during the year ended June 30th, 1921. During the latter part of the year the company secured considerable supplies of equipment, the balance of which has been landed since closing the year's accounts. Prompt delivery of material can be offered which has hitherto been very scarce. From the New Zealand Government substantial orders have been received, some of which have been executed, and others are still in course of manufacture. Collingwood exchange (Melbourne) and extensions to City North (Sydney) should be completely furnished during this current year; also Sydenham and St. Albans (Christchurch), New Zealand. The department proposes to extend the automatic system to Queensland, and is preparing a specification for Albion and Newmarket (Brisbane).

A Swiss Investment Company.—It is announced that the Swiss Bank Verein and two other Swiss financial institutions have taken over a 7 per cent. ten-year loan for 10,000,000 fr. of the Columbus Electrical Undertakings Co. of Baden. The latter, which has a share capital of 30,000,000 fr., is said to require fresh funds for consolidating its current liabilities and for providing means for the extension of the Compania Italo-Argentina de Electricidad of Buenos Aires, in which the Swiss company holds a considerable portion of the share capital. The dividend of the Columbus company for the past year is at the rate of 8 per cent., as in 1919-20.

Belgian Companies.—The report of the Société Intercommunale Belge d'Electricité, of Brussels, for the year ending June 30th last shows a profit of 1,725,751 fr., as compared with only 424,880 fr. in the preceding twelve months.

A profit of 271,447 fr. for the year ending June 30th last is shown in the report just issued by the Société d'Electricité de l'Ouest de la Belgique, of Brussels, as compared with only 67,756 fr. in the preceding twelve months.

Prospectus.—*Indicators, Ltd.*—The list is to close to-morrow, October 22nd, in an issue of 15,327 7 per cent. cumulative preferred participating shares of £1 each at par. The company was formed in 1919 to acquire certain patents for automatic electrically-operated indicator apparatus to be placed in railway carriages, on platforms, and on tramway cars and at tramway signal stations. The present issue is made to provide further working capital and to complete important contracts already obtained.

Stothert & Pitt, Ltd.—Further dividend of 7½ per cent., making 12½ per cent., free of tax. The balance is carried forward, subject to E.P.D.

Anglo-American Telegraph Co., Ltd.—Interim dividends for quarter ended September 10th 15s. per cent. on ordinary stock and £1 10s. per cent. on preferred stock, less tax.

Indo-European Telegraph Co., Ltd.—Interim dividend for the half-year ended June 30th at the rate of 5 per cent. per annum, free of tax.

United River Plate Telephone Co., Ltd.—Interim dividend of 3 per cent. (3s. per share) on the old ordinary shares, free of tax, for the half-year ended June.

STOCKS AND SHARES.

Tuesday Evening.

The sensational slump in the value of the German mark stands out as one of the prominent features of the Stock Exchange this week. It has played its part in bringing about further depression in many of the markets. Liquidation from Holland was ascribed to the need for realising money on the part of Dutch holders of marks, who saw their paper rapidly depreciating in value. Meanwhile, there has been heavy selling at home. Several big accounts in the city are known to have given trouble just lately, part of which trouble has probably been adjusted, though the settlement leaves behind a legacy of nervousness. In the circumstances, it is not surprising that markets find a difficulty in showing improvement. The new issues continue amongst the firm spots in the House. Lancashire Power debenture stock has recovered to 3¼ premium after being 2¼ premium. County of London Electric new debenture has risen to 4¼ premium. Mersey Power debenture, which opened at 1¼ and fell to ⅝ is now 1 premium, while several others of older date are maintaining their prices. Clyde Valley 8 per cent. second preferences are still about 1/16 discount.

Amongst electricity supply shares, County of London ordinary eased off to 8¾, on selling by people who were exchanging from ordinary shares into the new debenture stock. Charing Cross ordinary at 4¾ are ⅛ better. These are the only changes in the London list. Active business is being done in the County of London fully-paid debenture stock on the basis of 97¼. Shropshire, Worcestershire & Staffordshire Electric Power 6 per cent. preference changed hands the other day at 10s. The debenture stock is barely "par."

Victoria Falls ordinary are 10s. 3d. The company's debentures have recently been rising, and the 5 per cent. first mortgage stands about 103, while the 5½ per cent. second mortgage is 102¼. For both there is some little demand. The preference also keep hard at 18s.

An amount of £200,000 8 per cent. first mortgage debentures in the North Wales Power & Traction Co., Ltd., unconditionally guaranteed as to principal and interest by the Aluminium Corporation, Ltd., is being offered at 97. One-third of the circular containing the offer is occupied by a copy of a letter received from the managing director of the company, in which he sets out a short history of the company, and gives an account of its progress. The following paragraph relates to the profits:—

"The sales of the North Wales Power & Traction Co. for the eight months ended August 31st last were at the rate of £27,279 per annum. The agreements already arranged for the supply of energy to Llandudno, Colwyn Bay, and Llysfaen will increase receipts from sales by £25,000 per annum. The transmission lines from Colwyn Bay to Chester and Wrexham should be completed in the course of next year, and should produce a further income of £62,500 per annum. The company will then have an income, after deduction of working and other costs, of approximately £70,000 per annum available for the payment of the interest amounting to £40,000 per annum."

It will be noticed that there is a good deal of estimate about this profit-statement, and it may be that investors will prefer other stocks where the amount available for interest can be more definitely shown.

The cable group is one of the very few departments in the Stock Exchange that show a firm front. Westerns are 5s. better. Globes are 7s. 6d. up. Eastern ordinary recovered a point more than its dividend of 50s., and Eastern Extension shares gained the 5s. dividend taken off last week. Other parts of the cable market are steady, with Anglo-American deferred a little better at 17½. Oriental Telephones are 2 ex dividend, and United River Plates at 5¼ have further given way. Marconis have come on offer at 32s. 6d.; Marconi Marines weakened to 17s. 6d. Radio Corporations, at 10s. for the common and 9s. 3d the preferred, are both lower. American dollar stocks in utility companies mostly stand substantially down on the week, owing to the fact of the New York Exchange having touched nearly 4 dollars to the £. In none of them, however, is there any increase of business. Mexicans are inclined to give way. Mexican Light & Power preferred shed a point. For the company's second mortgage bonds there has been a fairly good demand in the neighbourhood of 48¼. Brazilian Tractions at 29 are a point higher, and Anglo-Argentine second preference shares stiffened to 2¼.

Iron, coal, and steel shares have fallen noticeably, and with them Babcock & Wilcox lost 3s. 9d., declining to 45s. Edison-

Swans fell a florin to 6s. 9d., and English Electrics continue heavy. General Electric ordinary at 16s. 3d. are again 1s. 3d. down. The company's preference shares of both classes remain at 17s. 6d. Any shares which were saleable at all have had to be overhauled with a view to the possibility of their having to go in satisfaction of claims arising out of all kinds of commitments, financial and commercial, which have become clamant owing to the vagaries of the exchanges. There are few markets round the Stock Exchange in which this factor is not making itself felt at the present time. The rubber market manages to evade the depression to some extent, owing to the price of rubber having gone up a little during the past few days.

Underground Electric incomes are 4 points down at 70½. Metropolitans gave way to 24. The suggestion that the Government should lend money to the railway companies at a low rate, in order that the railways might, in their turn, employ large extra numbers of men, has found no welcome in high quarters, and the consequence is that Home Railway stocks are as much out of favour as ever.

People who had stock open before the end of July, 1914, are faced with the knowledge that they must clear off whatever liabilities remain before the beginning of next August. Their efforts to sell stock in order to meet such liabilities are accelerating the pace at which prices fall under the influences of demoralised foreign exchanges, unemployment, and bad trade. The picture is a dark one, and everybody in the city is so saturated with pessimism that even to suggest a ray of light on the situation is to be scouted as an extreme optimist. Moreover, it must be candidly confessed that to entertain any hope of immediate improvement, either in Stock Exchange prices or business, does seem to be indulging in a larger amount of licence than immediate circumstances appear to warrant.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1919.	Dividend 1920.	Price Oct. 18, 1921.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	12	12	6¾	—	£9 8 2
Charing Cross Ordinary	7	8	4⅞	+ ⅛	9 2 4
do. do. do. 4½ Pref.	4½	4½	3⅝	—	7 4 4
Chelsea	4	6	3¾	—	9 4 8
City of London	13	14	1⅞	—	10 13 4
do. do. 6 per cent. Pref.	6	6	17/3	—	6 17 2
County of London	8	8	8¼	— ¼	9 0 4
do. do. 6 per cent. Pref.	6	6	8	—	7 10 0
Kensington Ordinary	7	9	4½	—	10 0 0
London Electric	2½	2½	1	—	7 10 0
do. do. 5 per cent. Pref.	6	6	2¾	—	10 9 0
Metropolitan	6	7	4	—	8 15 0
do. 4½ per cent. Pref.	4½	4½	2⅛	—	7 13 2
St. James' and Pall Mall	12	12	6¾	—	9 1 4
South London	6	7	2⅜	—	10 18 2
South Metropolitan Pref.	7	7	15/9	—	8 17 10
Westminster Ordinary	10	10	5½	—	8 13 10
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	87	—	6 18 0
do. Def.	1½	1½	17½	+ ½	8 11 6
Chile Telephone	6	6	5½	—	5 14 3
Cuba Sub. Ord.	7	7	7½	—	9 13 2
Eastern Extension	10	10	166xd	+ ½	6 1 0
Eastern Tel. Ord.	10	10	166xd	+2½	6 0 1
Globe Tel. and T. Ord.	10	10	16½	+ ½	6 0 4
do. do. Pref.	6	6	9¼	—	6 9 9
Great Northern Tel.	22	24	24½	— ½	9 15 8
Indo-European	10	10	30	—	8 6 8
Marconi	25	15	13	—	9 4 7
Oriental Telephone Ord.	12	12	2xd	+9d.	*8 0 0
United R. Plate Tel.	8	8	6¼	— ⅛	*6 16 2
West India and Panama	Nil	Nil	5/-	—	Nil.
Western Telegraph	10	10	16½	+ ½	*5 19 5
Home Rails.					
Central London Ord. Assented	4	4	49½	—	8 1 8
Metropolitan	1½	1½	24	—½	6 5 0
do. District	Nil	Nil	16½	—	Nil
Underground Electric Ordinary	Nil	Nil	2	—	Nil
do. do. "A"	Nil	Nil	5 9	—	Nil
do. do. Income	4	3	71½	—4	*4 5 1
Foreign Trams, &c.					
Anglo-Arg. Trams, First Pref.	5½	12½	28	—	10 9 6
do. do. 2nd Pref.	Nil	6¼	5½	+ ½	10 9 6
do. do. 5 % Deb.	5	5	63½	—	7 17 0
Brazil Tractions	Nil	Nil	29	+1	Nil
British Columbia Elec. Ry. Pfce.	5	5	60	—	8 6 8
do. do. Preferred	5	9/-	53½	—	*8 14 2
do. do. Deferred	3	12½/-	54	—	*11 8 6
do. do. Deb.	4½	4½	63	—	7 1 8
Mexico Trams 5 per cent. Bonds	Nil	Nil	19	—	—
do. 6 per cent. Bonds	Nil	Nil	29	—	Nil
Mexican Light Common	Nil	Nil	9	—	Nil
do. Pref.	Nil	Nil	28	—	Nil
do. 1st Bonds	Nil	5	55½	—	9 0 0
Manufacturing Companies.					
Babcock & Wilcox	15	16	21½	— ⅜	7 2 3
British Aluminium Ord.	10	10	15/-	—	—
British Insulated Ord.	15	15	14	—	10 0 0
Callenders	15	15	1⅞	—	10 8 8
do. 6½ Pref.	6½	6½	18,9	—	6 14 8
Crompton Ord.	10	10	14,6	—	13 15 10
Edison-Swan	10	—	6/0	—9/-	—
do. do. 5 per cent. Deb.	5	5	68	—	7 7 1
Electric Construction	10	10	16/9	—	16 17 0
English Electric	8	8	9,8	—	15 4 10
Do. Pref.	6	6	13,6	—	8 11 6
Gen. Elec. Pref.	6½	6½	17,6	—	7 8 6
do. Ord.	10	10	16/3	— ⅛	12 6 2
Henley	15	15	1,7	—	10 5 0
do. 4½ Pref.	4½	4½	3¼	—	8 15 6
India-Rubber	10	—	3⅜	—	—
Met.-Vickers Pref.	8	8	1⅞	—	8 16 8
Siemens Ord.	10	10	1⅞	—	*9 8 2
Telegraph Con.	20	20	21½	—	*5 11 9

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, October 19th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic .. .. per lb.	7¾d.	..
a Ammoniac Sal .. .. .. per ton	£65	..
a Ammonia, Muriate (large crystal) "	£58	..
a Bisulphide of Carbon .. .. "	..	..
a Borax .. .. "	£31	..
a Copper Sulphate .. .. .. "	£31	..
a Potash, Chlorate .. .. .. per lb.	6d.	..
a " Perchlorate .. .. "	6d.	..
a Shellac .. .. per cwt.	£16 10s.	20/- inc.
a Sulphur, Sublimed Flowers .. "	£16	..
a " Lump .. .. "	£15	..
a Soda, Chlorate .. .. .. per lb.	3½d.	..
a " Crystals .. .. per ton	£7	..
a Sodium Bichromate, casks .. per lb.	7½d.	..
METALS, &c.		
p Babbitt's Metal Ingots .. .. per ton	£90 to £275	..
c Brass (rolled metal 2" to 12" basis) per lb.	10½d.	..
c " Tubes (solid drawn) .. "	1/0½ to 1/0½	..
c " Wire, basis .. .. "	11½d.	..
c Copper Tubes (solid drawn) .. "	1/2½	..
c " Bars (best selected) .. per ton	£103	..
c " Sheet .. .. .. "	£103	..
c " Rod .. .. .. "	£103	..
d " (Electrolytic) Bars .. "	£75	10/- dec.
d " " Sheets .. "	£145 10s.	..
d " " Wire Rods .. "	£91	10/- dec.
d " " H.C. Wire .. per lb.	11d.	½d. dec.
f Ebonite Rod .. .. "	3/6	..
f " Sheet .. .. "	3/-	..
g German Silver Wire .. .. "	2/0	..
h Gutta-percha, fine .. .. "	12/6	..
h India-rubber, Para fine .. .. "	1/3	1½d. inc.
i Iron Pig (Cleveland Warrants) .. per ton	Nom.	..
i " Wire, galv. No. 8, P.O. qual. "	£30	..
g Lead, English Pig .. .. .. "	£24 15s.	10s. inc.
g Mercury .. .. per bot.	£9 15s. to £10	5s. to 7/6 inc.
e Mica (in original cases) small .. per lb.	3d. to 3/-	..
e " " " medium .. "	4/- to 8/-	..
e " " " large .. "	10/- to 20/- & up	..
p Phosphor Bronze, plain castings .. "	1/4 to 1/9	..
p " " rolled bars and rods "	2/1 to 2/6	..
p " " rolled strip & sheet "	2/3 to 2/7	..
d Silicium Bronze Wire .. .. per lb.	1/3	½d. dec.
r Steel, Magnet, in bars .. .. "	1/8	..
n Tin, Block (English) .. .. per ton	£155 to £156	..
n " Wire, Nos. 1 to 16 .. .. per lb.	3/6	..
p White Anti-friction Metals .. per ton	£55 to £275	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
p ———
r W. F. Dennis & Co.

A Rotary Electric Furnace.—Alan D. Dauch, of the George J. Hagan Corporation, Pittsburgh, describes, in an article contributed to the *Electrical World*, a rotary electric furnace constructed by his firm. This was designed to permit continuous heat treating, annealing and carbonising, and took the place of an oil-fired furnace. The moving hearth is a continuous annular ring. The dimensions of the furnace are as follows:—Overall outside diameter, 19 ft.; outside height, 7 ft.; outside diameter of rotating hearth, 15 ft.; inside diameter of hearth, 5 ft.; width of hearth, 5 ft.; height of heating chamber, 2 ft. The furnace walls are of standard construction, bonded with "Adamant" cement and encased by sheet steel reinforced with structural beams. The hearth rotates on a series of roller bearings twenty in number. The furnace has two adjacent, pneumatically-operated doors for charging and discharging. The hearth is driven by an electric motor through gears capable of giving six speeds varying from one revolution in thirty minutes to one in seventy-five minutes. The heating elements are two in number, and consist of nickel-chromium ribbon mounted on the inner and outer walls of the furnace. The first section or heating zone extends from the charging door for two-thirds of the circumference; this has a 210-kW loading, the remainder, the "soaking" section, is 60 kW. The temperature of each zone can be maintained at any value between 200 and 1,800 deg. F. The heating current is 60-cycle, 3-phase, 440-V; the controls are operated by single-phase, 60-cycle, 110-V power.

Under actual operating conditions 11.75 lb. of steel has been heated to 1,525 deg. F. and soaked at the same temperature per kWh consumed. This is at the rate of 170 kWh per short ton. The charge per hour consists of approximately 3,000 lb. of various automobile parts such as spring clips, steering knuckles, connecting rods and front axles. The weights of the different parts vary from 3 lb. each to 180 lb. each. The time during which the pieces are in the furnace naturally depends on the cross-section and weight of the particular part. This feature of time in the furnace is very aptly taken care of by the different speeds at which the hearth may be revolved.

THE COMMERCIAL MOTOR EXHIBITION.

The Fifth International Commercial Motor Exhibition opened at Olympia on October 13th; it remains open until to-morrow, Saturday. The large building holds an imposing display of trade vehicles of all designs, typical of the advance made in recent years in this important branch of transport.

While petrol-driven vehicles predominate, there are several exhibits of electric vehicles, which are coming more and more into favour for operation within a moderate radius. Magnetos, of course, appear in large numbers, while the remainder of the exhibits of electrical interest are principally lighting systems for cars.

Messrs. Richard Garrett & Sons, Ltd., display a 2½-ton "electric" (fig. 1) for commercial purposes. This vehicle is capable of doing a 30-mile run on one charge at an approximate speed of 10 m.p.h. on a level road. The loading platform measures about 10 ft. x 6 ft., the overall length and width of the vehicle being 15.4 x 6.6 ft. respectively. The battery, which weighs about 21 cwt., consists of 44 "Ironclad Exide" cells. The drive is provided by a high-efficiency series-wound motor capable of withstanding a 300 per cent. overload. As this machine is made by an associated firm, it is designed in every particular to suit its proper application. The power is transmitted to a differential countershaft by a chain immersed in an oil bath. From this shaft two roller chains are connected to large-diameter sprockets on the rear wheels. The controller is of the segmental drum type and provides for four forward and two reverse speeds. The controller lever is situated on the steering column. A patent trip gear is fitted which ensures that the application of either foot or hand brake automatically returns the controller to "neutral"; this prevents a sudden start upon the release of the brakes. For starting on hills there is a pedal which cuts out the trip gear. The rest of Messrs. Garrett's exhibit consists of steam wagons and trailers.

Messrs. Newton Bros. (Derby), Ltd., have an exhibit confined to a 2½-ton carrier vehicle fitted with a steel end-tipping body. This is driven by a pair of motors spring mounted independently of the back axle. The actual drive is made by pinions on the motor shafts which engage with internal spur wheels fitted to the rear wheels of the vehicle. The controller is of the series-parallel type arranged to give six speeds, four forward and two reverse, the control lever is conveniently mounted near the driver's seat. All the driving gears are enclosed as a protection against mud and water. The motors can be replaced with little trouble as no dismantling of the rear axle is involved. An average distance of 22 miles can be covered on one charge.

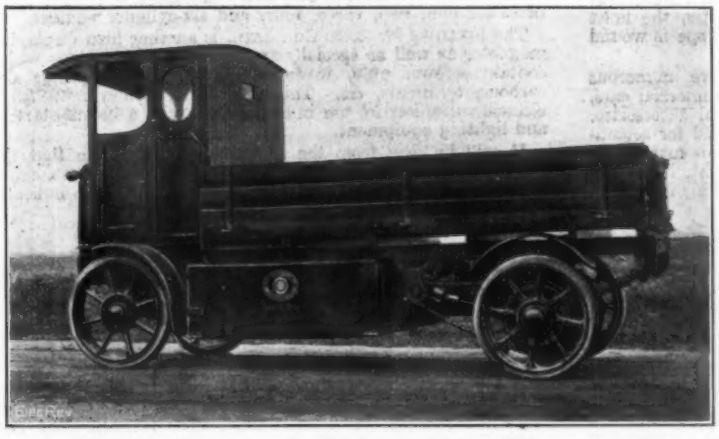


Fig. 1.—A Garrett 2½-ton Electric Vehicle.

The General Vehicle Co., Ltd., shows three examples of its electric vehicle construction. The largest is a 5-ton "G.V." wagon for the carriage of road-making materials, coal, ashes, &c. The body can be tipped to either side or endwise, the gear being electrically operated and controlled from the driver's cab. An end-tipping 2-ton chassis is shown; this is specially designed for the collection of house refuse.

In this vehicle the single motor is entirely enclosed. Power is transmitted to a countershaft by a Morse silent chain and from the countershaft to the rear wheels by roller chains. The controller is of the continuous torque type, so arranged that speed changes can be effected without shutting off power. It is placed under the driver's seat, and is easily accessible. Five forward and two reverse speeds are provided for.

The British Thomson-Houston Co., Ltd., has a large display of magnetos for a wide range of vehicles, including types "G 4" and "G 6" for light lorry engines; these are light-weight machines with laminated pole pieces, spark gap distributors, and rotary safety gaps. The armature housing, distributor end plate, and driving end plate are die cast as a single unit. A "Tungar" rectifier is on view, as well as a "Type G" magneto with impulse starter. The latter enables the heaviest engine to be started with a minimum of effort and without danger of backfire.

Guy Motors, Ltd., display, among a number of petrol-propelled vehicles, an electric wagon of from 2 to 2½ tons capacity.

Clayton Wagons, Ltd., also exhibit an electric vehicle. In this wagon, which is capable of dealing with a 3-ton load, the motor and crankshaft are arranged as one unit.

Messrs. Ransomes, Sims & Jefferies exhibit examples of their "Orwell" vehicles and trucks. A 4-ton lorry is included in the exhibit. This is driven by two motors each of from 4 to 12 b.h.p. capacity according to speed and load conditions. The battery consists of 40 cells with an output of 323 ampere-hours. The speed of the vehicle is roughly 7 m.p.h. on a level road. The 2-ton electric refuse-collecting vehicle shown has an electrically-operated tipping gear. This gear consists of a powerful horizontal square-threaded shaft working through a heavy bronze crosshead, and is connected by links and rollers to the channel framework to which the body is secured. The gear is driven by a cross-shaft through enclosed bevel gearing. Two trucks are on view. One is a four-wheeled truck, fitted with an elevating platform, capable of dealing with a load of 4,000 lb. with a maximum speed of 5 m.p.h. The other is of the same carrying capacity but three-wheeled; this is fitted with a single series motor, while the four-wheeled type has two separate motors. The item which is probably attracting the most attention is a new runabout crane (figs. 2 and 3), which must be unrivalled for ease of manipulation. This has a lifting capacity of 15 cwt., its overall width does not exceed 6 ft., and it can be rotated in a 6 ft. 3 in. diameter circle. There are two independent motors driving two opposite wheels, while at right angles to these drivers, on each side, are other wheels; this ensures an even distribution of weight. The truck for purposes of travelling, either forward or reverse, is operated by a directional controller, placed on the right-hand side of the driver, and operated by a lever (1) (fig. 3) working in a gate, interlocked with the left foot pedal (5) which controls a resistance drum and only by depressing the pedal control which breaks the circuit, can the controller handle be placed in the forward or reverse positions. By releasing the pedal (5) circuit is made through a series of resistance steps which govern the speed of the vehicle. The current can be cut off immediately by depressing the pedal. The brake pedal (2) actuates two compensated brake bands working on drums keyed on the motor spindles. These brakes can be used either as service or ratchet brakes. The batteries

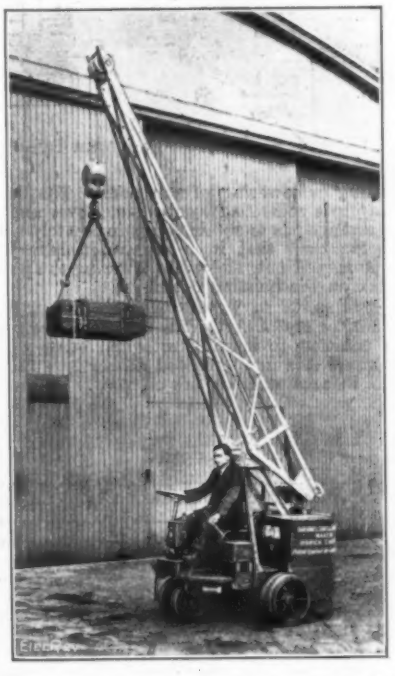


Fig. 2.—Ransomes' Electric Runabout Crane.

cc supply the energy and constitute permanent counterweights. By turning the steering wheel (3) and lifting a pawl on the top of the master controller (4), the steering wheels, both front and rear, (D) and (E), can be turned and locked at 90 deg. to the driving wheels. At the same time a series of contacts situated in the master controller reverse the field of one of the driving motors (A) or (B), which are thus connected so as to exert a "couple" on the whole structure. The crane controller is placed on the left of the driver, and is operated by a lever (6) working in a gate, controlling the

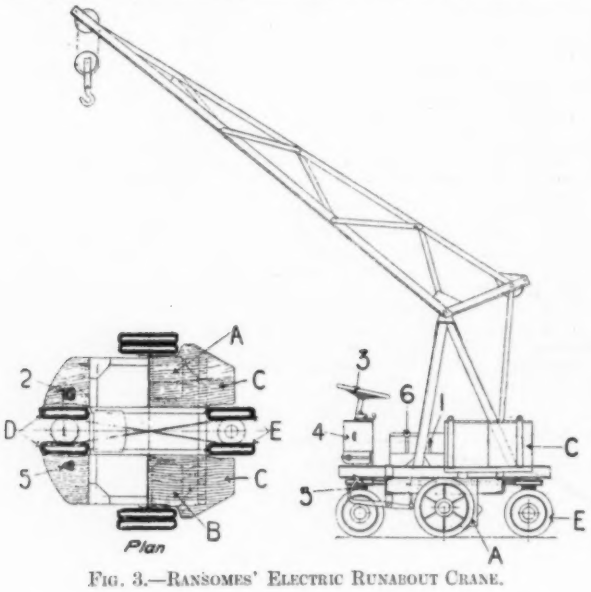


Fig. 3.—Ransomes' Electric Runabout Crane.

raising or lowering of the hook. The derricking motion of the jib is controlled by the same lever and the mechanism is so arranged as to obtain an approximately horizontal movement of the load, that is to say, when lifting the jib, the hoist rope is paid out, and when lowering the jib the rope is wound back on the hoisting drum.

Messrs. C. A. Vandervell & Co., Ltd., have numerous examples of "C.A.V.-Willard" batteries for commercial cars, in addition to lighting sets and other electrical accessories. Samples of a new threaded rubber insulation, used for separators in accumulators, are on view. Although this material is so closely woven as to prevent the passage of light, it permits free circulation of the acid in an accumulator and, moreover, has a much longer life than any previous type of separator material. The base of the material is rubber; this is pierced by small cotton threads—196,000 to 30 sq. in. Among the advantages claimed for this material are high voltage maintenance and low heat characteristics. Among the lighting dynamos exhibited is the "N.G.S.C." type which has an output of 180 watts at a pressure of 12 volts. This is suitable for most classes of commercial vehicle. An aluminium switchboard is shown upon which are mounted instruments and three switches for controlling the dynamo, head and tail, and side and tail lights. A two-pin plug is fitted for the insertion of an inspection lamp. All types of lamps for vehicles are displayed and the exhibit also includes examples of a strong and well-made illuminated sign for fixing to the front of a vehicle for advertising purposes. This contains three low-voltage lamps which can be supplied from a battery or dynamo. A wide range of sparking plugs also appears on this stand.

Conner Magneto & Ignition, Ltd., show a selection of their "C.M.I." magnetos. The firm also exhibits its coil ignition system. In this the coil is built up on a laminated core. A moving armature or vibrator whose time frequency varies as the voltage in the coil primary is fitted. A resistance is connected across this, being normally short circuited. As the speed of the vibrator increases, the short circuit is opened and the resistance comes into use, cutting down the value of the current from the battery to normal. The contact breaker is driven at camshaft speed, and the points are shunted by a condenser. The contact breaker has a distributor of moulded insulation having segments, corresponding to the number of cylinders, embedded in it. These segments are traversed by a carbon brush rotating with the camshaft. In this appliance the ignition value of the spark is kept constant irrespective of the engine speed. Fitted upon this stand, for demonstrative purposes, is a "Lorrilite" set for vehicle lighting. This consists of a small self-regulating magneto-dynamo with a normal output of 24 watts, which, however, can be exceeded if necessary. The dynamo is mounted adjacent to the engine and is driven at about four times the crankshaft speed by means of a pulley and clutch. The magnetic field is composed of three tungsten steel magneto magnets, and the armature is an assembly of laminations on a hollow straight shaft. Between speeds of 2,000 and 5,000 r.p.m., the output is practically constant, as is shown by demonstration, but sufficient light for a standing vehicle is given at 1,150 r.p.m. (armature speed), and the dynamo can be run up to 5,500 r.p.m. without injury.

Messrs. Tilling-Stevens Motors, Ltd., display examples of their petrol-electric vehicles. These are an omnibus with a 40-h.p. engine; a "charabanc de luxe"; and 2-ton and 4-ton vehicles. The system is noted for its efficiency between the petrol engine and the driving motor as well as the case of control. The dynamo is driven direct from the engine flywheel by a laminated spring connection. The motor is directly coupled with the cardan shaft driving the rear axle; the final drive is by worm gear. The controller and speed regulator are carried in separate aluminium cases. The controller is of the tramway type, operating by varying the resistance in the shunt field of the generator, and by shunting the series field of the motor. By cutting out the motor and taking leads from a special pair of terminals on the dynamo, the set can be used as a portable arc-welding equipment. The engine and generator can also be used for numerous power purposes as they form a complete self-contained power plant.

Messrs. North & Sons, Ltd., exhibit several models of "Watford" magnetos, some of which are specially designed to take the place of Bosch magnetos. A special "Ford" type is also shown.

The British Lighting & Ignition Co., Ltd., also has a large display of magnetos suitable for all types and sizes of engines. In the "S.H." types, the current is produced at a low pressure and a coil is used to transform this to the correct ignition value. Starting and lighting equipment also appears on this stand. The "B.L.I.C." starting motor is of simple construction. The starter drives the engine by means of a sliding pinion which engages a gear ring on the periphery of the flywheel. When the engine fires it over-runs the motor and automatically thrusts the pinion out of engagement—a pull-off spring assisting this action. The lighting equipment consists of a dynamo and battery together with the necessary lamps and switches. The battery is charged during the daytime, the maximum charging rate corresponding to a speed of 20 or 25 m.p.h.; when the lights are all on at night, the charging rate is maintained. The pulling-out of the side and tail lights switch automatically establishes the maximum charging rate.

The Lucas Electrical Co., Ltd., exhibits examples of magnetos for one, two, three, four, and six-cylinder engines.

The Fellows Magneto Co., Ltd., is another firm displaying magnetos as well as specially-arranged spare part cases which contain screws, nuts, washers, contact-breaker springs and carbons, terminals, &c. This firm is also showing a small electric vulcaniser for use in conjunction with a 12-volt starting and lighting equipment.

It will be seen from the above short description that the electrical engineer has played a large part in this year's show, and the increase in the number of electric vehicles indicates great activity in this direction.

THE TRADE OF AUSTRALIA.

[Imports and Exports.]

The following figures, showing the values of the imports of electrical and allied goods into Australia in 1919-20, are taken from the recently published official trade returns. For purposes of comparison the figures for 1918-19 are given, and notes of increases or decreases are made. Only in the case of cables is it possible to indicate any unit other than value.

	1918-19 £	1919-20 £	Inc. or dec. £
Gas and oil engines.			
Total	141,000	255,000	+114,000
From United Kingdom	25,000	133,000	+108,000
,, Canada	10,000	11,000	+ 1,000
,, United States	106,000	99,000	– 7,000
,, Sweden	—	3,000	+ 3,000
High-speed reciprocating steam engines (direct coupled).			
Total	1,000	4,000	+ 3,000
From United Kingdom	1,000	4,000	+ 3,000
Dynamo-electric machines, static transformers, induction coils, electric fans and parts thereof.			
Total	501,000	731,000	+230,000
From United Kingdom	182,000	324,000	+142,000
,, United States	308,000	390,000	+ 82,000
Regulating, starting and controlling apparatus.			
Total	93,000	125,000	+ 32,000
From United Kingdom	23,000	48,000	+ 25,000
,, United States	66,000	74,000	+ 8,000
Electric fittings, viz., switches, fuses and lightning arresters.			
Total	112,000	174,000	+ 62,000
From United Kingdom	30,000	95,000	+ 65,000
,, United States	64,000	71,000	+ 7,000
,, Japan	16,000	6,000	– 10,000

	1918-19 £	1919-20 £	Inc. or dec. £
Electric heating and cooking appliances.			
Total	15,000	19,000	+ 4,000
From United Kingdom	7,000	9,000	+ 2,000
,, United States	8,000	10,000	+ 2,000
Electrical appliances, other.			
Total	421,000	323,000	– 98,000
From United Kingdom	58,000	107,000	+ 49,000
,, United States	168,000	153,000	– 15,000
,, Japan	54,000	17,000	– 37,000
,, Netherlands	140,000	29,000	–111,000
Telephone apparatus.			
Total	81,000	99,000	+ 18,000
,, United Kingdom	9,000	34,000	+ 25,000
,, United States	70,000	59,000	– 11,000
Accumulators or storage batteries.			
Total	119,000	128,000	+ 9,000
From United Kingdom	11,000	44,000	+ 33,000
,, United States	107,000	81,000	– 26,000

Fig. 1.

Fig. 1.—The Valley on the Up-stream Side of the Power House, Before Inundation.

	1918-19 £	1919-20 £	Inc. or dec. £
Arc lamp carbons.			
Total	19,000	13,000	– 6,000
From United Kingdom	1,000	4,000	+ 3,000
,, United States	17,000	3,000	– 14,000
Arc lamps, carbon in blocks, vacuum tubes, measuring and recording instruments, insulating tape.			
Total	143,000	138,000	– 5,000
From United Kingdom	31,000	65,000	+ 34,000
,, United States	99,000	48,000	– 51,000
Lamps and lampware.			
Total	176,000	169,000	– 7,000
From United Kingdom	25,000	50,000	+ 25,000
,, Japan	27,000	19,000	– 8,000
,, United States	108,000	90,000	– 18,000
Steam turbines, economisers, superheaters, &c.			
Total	80,000	139,000	+ 59,000
From United Kingdom	74,000	109,000	+ 35,000
,, United States	5,000	21,000	+ 16,000
Cable and wire, covered.			
Total ... ... Tons	4,000	3,740	– 260
£	612,000	631,000	+ 19,000
From United Kingdom ... Tons	825	2,955	+ 2,130
£	147,000	532,000	+385,000
,, Canada ... ... Tons	450	148	– 302
£	49,000	14,000	– 35,000
,, Japan ... ... Tons	1,700	337	– 1,363
£	293,000	51,000	–242,000
,, United States ... Tons	970	300	– 670
£	123,000	34,000	– 89,000

It is interesting to note that Australia has made a beginning in the export of electrical machinery and appliances. The values of such goods, of Australian manufacture, are given below :—

	1918-19 £	1919-20 £	Inc. or dec. £
Machinery and appliances, electrical.			
Total	8,000	12,000	+ 4,000
To New Zealand	3,000	6,500	+ 3,500
,, Fiji	1,000	3,000	+ 2,000
,, Papua	1,500	1,000	– 500
,, Java	1,500	—	– 1,500
Electrical materials.			
Total	2,500	12,000	+ 9,500
To New Zealand	1,200	10,000	+ 8,800
,, Fiji	250	1,000	+ 750

NORTH WALES COUNTIES ASYLUM, DENBIGH.

A Hydro-electric Installation.

In 1919 the North Wales Counties Asylum Authorities instructed Mr. S. E. Britton to report to them upon several water resources located within a few miles' radius of the Asylum, with a view to utilising water-power in place of their existing steam plant for generating electricity. In the following year the Asylum Authorities decided upon the development of a scheme on the river Ystraad, and applied to the Lunacy Commissioners and the Ministry of Health for sanction to proceed with the development.

The river Ystraad passes through land belonging to the Authorities, and the site selected for the hydro-electric installation is about 400 yards distant from the Asylum.

The area of the catchment utilised by the installation is 17 square miles, and the average rainfall in the district 50 inches

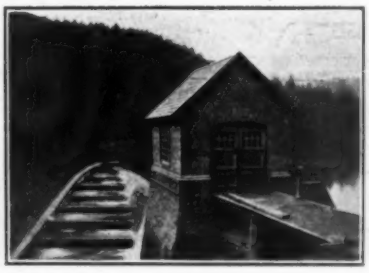


Fig. 2.

Fig. 3.

Fig. 2.—The Power House and Fish Pass.
Fig. 3.—The Power House, Dam, and Reservoir.

per annum, from which it was calculated that the erection of a dam to give a fall of 15 ft. and a reservoir having an area of three acres would provide water power capable of producing electricity to the extent of 200,000 kWh per annum.

The scheme involved the erection of a dam 160 ft. long across the valley of the river, a fish pass to facilitate the passage of

Fig. 4.

Fig. 5.

Fig. 4.—The Dam During Construction.
Fig. 5.—The Wooden Former being Concreted in, to Form the Draught Tube.

fish over the dam, and a power station housing a water turbine and generator and switchgear.

A specification was prepared and sent to several contractors, but owing to the unsettled state of labour and cost of materials and the difficulty of obtaining the class of materials required, no tenders were received. The Asylum Authorities then empowered Mr. Britton to make the best arrangement he could to carry out the work, by direct labour or otherwise.

A contractor was eventually found who was prepared to carry out the excavations and concrete work to a schedule of prices, subject to fluctuations in cost of labour and materials. Messrs. J. Gordon & Co. contracted for the supply and erection of the turbine, generator, switchboard, sluice gates, and strainer rack, and the other sections of the work were carried out by direct labour.

Figure 7 is a general layout of the scheme, showing the ground level of the valley, the depth to which excavations had to be carried, and the arrangement of the dam and fish pass.

Figure 6 gives a vertical section of the power house. The turbine is of the Francis vertical-shaft type, designed to

develop 120 h.p. at 270 revolutions per minute, when working with a fall of 15 ft. The generator is also of the vertical-shaft type, having an output of 700 amperes at 120 volts, and is direct coupled to the turbine.

Two 0.75 sq. in. paper-insulated lead-sheathed and steel-armoured cables are laid direct in the ground. These connect

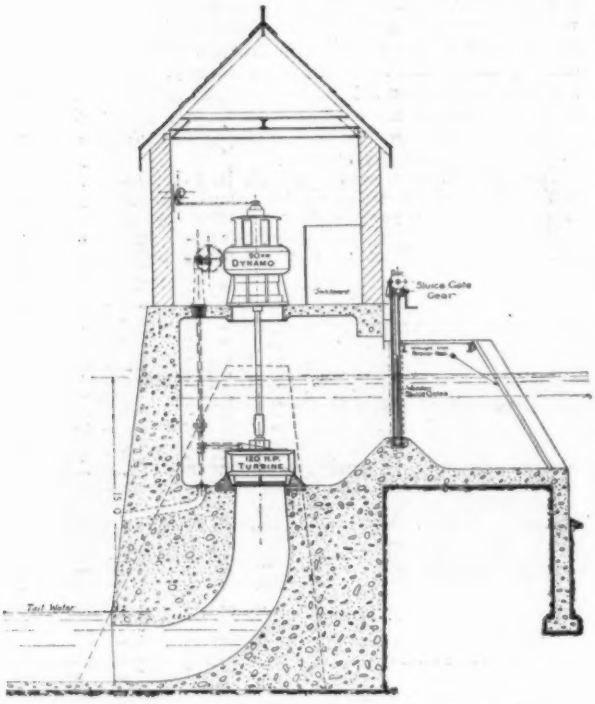


Fig. 6.—Vertical Section of Power House and Dam.

the generator to the main switchboard in the power house at the Asylum, where steam plant has been in use for a number of years. This power house contains three 35-kW steam dynamos, which in the past have supplied 85,000 kWh per annum for lighting and power purposes.

The water power installation will now be used in place of the steam plant, and it is intended to install additional electrical apparatus so as to utilise to the full the possible output of the hydro-electric installation.

We are indebted to Mr. S. E. Britton for the photographs and particulars embodied in this article.

ELECTRICAL NOTES FROM INDIA.

(FROM OUR BOMBAY CORRESPONDENT.)

It is understood that the directors of the Bombay Electric Supply & Tramways Co., Ltd., have decided not to proceed with the installation of two 6,000-kW Curtis turbines, condensing plant, and the necessary boilers, &c. (already purchased in England), but to take energy in bulk for the present from the Tata Hydro-electric Supply Co., Ltd., to meet the demands for power in Bombay.

This decision is doubtless the result of the prevailing price of coal in India, something like Rs. 25 per ton being paid at present for coal used at their Kussara power station.

As previously noted, the Tata Hydro-electric Supply Co., Ltd., furnishes some 3,000 kW during the evening, to assist the B.E.S. & T. Co. over the peak, this supply being taken to the Esplanade sub-station of the Tramways Co. and there transformed.

At present no means exist for paralleling the two systems (except on the d.c. side of converters), but there is nearing completion at Kussara, a small sub-station containing three transformers, each of 150-kVA capacity, which will be used as regulators, to enable the Tramways Co. to parallel with Tata's for a brief period while certain Kussara feeders are being changed over from one supply to the other. These regulators are necessary, as the supply from Tata's is at 6,600 V, and that from the Kussara power station 5,500 V.

The rating of these regulating transformers is somewhat misleading, the 150-kVA capacity of each regulator representing the load only, as between the 5,500 V and the 6,600 V supplies, and not the main supplementary supply.

The capacity of the Kussara power station is at present 15,000 kW, made up of:—

One 6,000-kW Curtis turbine.
Two 2,000-kW Brush-Parsons turbines.
Two 1,000-kW Brush-Parsons turbines.
Three 1,000-kW Brush E.E. Co.'s reciprocators.

But the B. & W. boiler equipment is inadequate for more than about 10,000 kW, *i.e.*, allowing for the necessary number of boilers being out of commission for overhaul, hence the need for the additional supply in bulk from Tata's.

The temporary illuminations for the Prince of Wales's visit in November have had to be curtailed somewhat, though certain facilities have been granted to the Taj Mahal Hotel (Bombay's chief caravanserai) for extra power.

Certain extensions are in hand in the northern part of Bombay Island, to cope with the demand for power, which extra load will be taken from Tata's as occasion demands; but the two systems will not be operated in parallel, except at the moment when the load on certain feeders is being transferred.

Hydro-electric Development in Southern India.

The limited supplies of coal, and other kinds of fuel in India, coupled with the prevailing high prices of these commodities, has inevitably drawn the attention of the Government and of electrical men in general, to the tremendous resources of power which India possesses in its rivers. The develop-

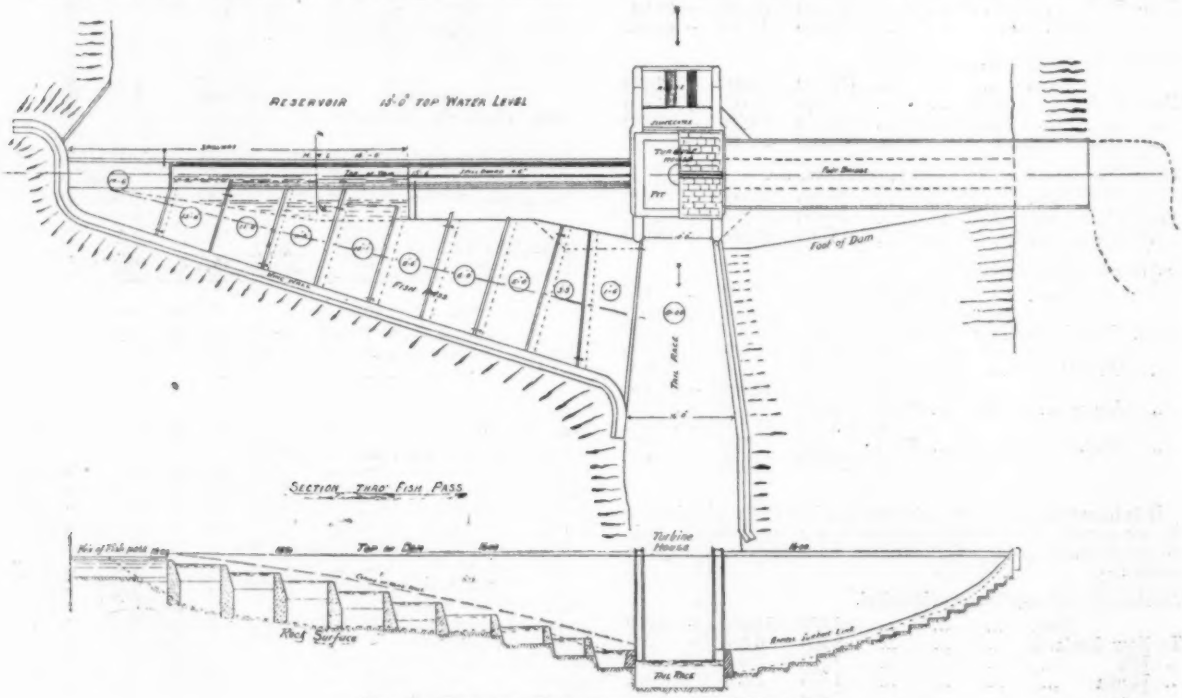


Fig. 7.—Plan and Elevation of Dam and Fish Pass.

ment of industries was rendered difficult, without an abundant and cheap supply of power; and this lack has retarded, as much as anything, the expansion of Indian industrial life.

The great house of Tata realised this, and directed its energies to the harnessing of falls on the Bombay side, as stated here recently.

These notes are devoted chiefly to a *résumé* of the hydro-electric undertakings at present in operation, and projected, in Southern India.

The Kaveri hydro-electric scheme at Sivasamudrum in Mysore has been in operation since 1902, and has received some notice in the technical Press. Originally designed for a capacity of 4,000 kW, this power station is to be increased to some 32,000 kW by means of a dam. At a site known as Kanambadi, a dam some two miles across has been built. The first stage of this work will increase the water supply to 750 cusecs in the summer months; and the second stage will further increase this to 900 cusecs, ensuring a constant supply which will develop 32,000 kW.

A great difficulty with nearly all Indian rivers is that the flow is not regular and constant, and in dry weather some rivers completely dry up; therefore in order to carry out useful hydro-electric schemes, it becomes necessary to dam these streams, and conserve the enormous quantities of water which come down in the monsoon.

This is what is being done at Kanambadi, and it will enable the supplies of electricity to the Kolar gold fields, the cities of Bangalore, Mysore, &c., to be considerably augmented.

There are several other projects in connection with the same river (says the *Times of India* Engineering Supplement) where advantage will be taken of some important falls on a tributary. It will thus be seen that the Mysore State is taking full advantage of the Kaveri river, which is such an asset to the country.

It was one of the Dewans (Prime Ministers) of His Highness the Maharajah of Mysore, who held office from 1883 to 1891 (Sir Sheshadri Iyer) who first launched the above undertaking. He enlisted the assistance of the best engineers he could find; and it speaks well for their enterprise and skill that the project has proved so progressive since its inauguration.

It appears that the existing turbines are to be replaced with new Francis turbines; that the l.p. busbars are to be duplicated; and that the step-up transformer house is to be removed from the head of the cliff, and reconstructed and extended as a part of the present generating station.

The Government of India, a few years ago, appointed officers to carry out a hydrographic survey of India. Though in the time specified it was not possible to do more than give a superficial report of the great possibilities, it was quite clear that their survey opened up many new avenues, if funds should become available for carrying out the suggestions.

The *Times of India* Engineering Supplement has just referred to several other schemes which are contemplated, or in operation. One of these is for the harnessing of the Gersoppa Falls. Though the amount of water coming over these falls is much less than some of the more famous ones in Africa and America, the fall is said to be one of the largest in the world. The river Sharavarti has a sheer drop of nearly 900 ft., and forms certainly one of the impressive sights in the world. A scheme has been worked out whereby the waters of the river will be dammed at some distance above the falls. The financial aspect of the scheme, and the doubtfulness of the demand within a reasonable distance have caused the scheme to be held up, but "it would form one of the greatest schemes in the East if it were carried through." "Mysore is in the van in hydro-electric schemes, and the advantage is already felt in the revenues of the State. If these schemes are carried out it will then be possible to carry on the smelting of the iron at the Bhadravarati works some 60 miles away."

A much smaller scheme referred to relates to streams flowing down the Nilgiri Hills to the plains. One of these rivers was dammed at a place called Kateri, above a place where the river takes a great leap of several hundred feet. The Government of India had built at a distance of four or five miles from this place a large cordite factory, where all the cordite used in India was made. The power required for working this large works was obtained from the generating station near the fall. The dam is 38 ft. high, and there is an effective head pressure of 620 ft. This is the first of several larger schemes which are to be carried out by the Tata Co.

Another hydro-electric scheme in South India is one situated at Gokak. Here one of the tributaries of the Kistna falls over a high rock, nearly 200 ft. high. The name of the river is the Ghatparba. During the monsoon this fall is one of the finest in India, for a mighty volume of water flows over the rock. The supply required for the generating station is taken off at a point a couple of miles above the falls and is conveyed by channels to a point on the right bank of the river, where it falls over the rock. Here the station has been built, which supplies the generating power needed for the large cotton mills built in the vicinity.

During the hot season very little water passes over the falls, for practically all the supply is needed for the turbines. These schemes, says the writer, show that the people are awakening to the value of hydro-electric power for the development of industrial life, and there are signs that the progress will be much more rapid in the future than up to date. India needs all the "white coal" she can procure, and she needs men of wide views and enterprise to develop the great possibilities that lie in the many rivers she possesses.

IMPORTS OF NEW ZEALAND.

The following table shows the values, and in certain instances the quantities, of electrical and allied goods imported into New Zealand in 1920, according to the recently issued official trade returns. The figures for 1919 have been given for purposes of comparison, and notes of increases or decreases added.

		1919	1920	Inc. or dec.
Electric batteries and cells.—				
Total	£	43,000	44,000	+ 1,000
From United Kingdom ...		6,000	15,000	+ 9,000
,, United States ...		36,000	29,000	− 7,000
Generators, motors and transformers.—				
Total	£	103,000	241,000	+138,000
From United Kingdom ...		34,000	103,000	+ 69,000
,, United States ...		68,000	134,000	+ 66,000
Insulated cable and wire.—				
Total	£	122,000	289,000	+167,000
From United Kingdom ...		70,000	237,000	+167,000
,, United States		9,000	23,000	+ 14,000
,, Japan		40,000	6,000	− 34,000
Electric lamps.—				
Total	£	77,000	97,000	+ 20,000
From United Kingdom ...		16,000	34,000	+ 18,000
,, Netherlands		21,000	24,000	+ 3,000
,, Japan		3,000	1,000	− 2,000
,, United States		36,000	37,000	+ 1,000
Carbons in blocks.—				
Total	£	23,000	13,000	− 10,000
From United Kingdom ...		8,000	6,000	− 2,000
,, United States		14,000	6,000	− 8,000
Other electrical material.—				
Total	£	191,000	250,000	+ 59,000
From United Kingdom ...		41,000	112,000	+ 71,000
,, United States		135,000	114,000	− 21,000
,, Japan		8,000	11,000	+ 3,000
Electricity meters.—				
Total	No.	6,000	10,500	+ 4,500
	£	12,000	32,000	+ 20,000
From United Kingdom ...	No.	1,200	5,280	+ 4,080
	£	3,000	20,000	+ 17,000
,, Switzerland	No.	800	940	+ 140
	£	1,140	2,400	+ 1,260
,, United States ...	No.	3,900	5,000	+ 1,100
	£	7,750	9,400	+ 1,650
Recording and testing instruments and meters.—				
Total	£	6,000	12,000	+ 6,000
From United Kingdom ...		3,000	9,000	+ 6,000
,, United States ...		3,000	2,000	− 1,000
Telephones and accessories.—				
Total	£	112,000	39,000	− 73,000
From United Kingdom ...		14,000	28,000	+ 14,000
,, United States ...		98,000	8,000	− 90,000
,, Sweden		—	3,000	+ 3,000
Copper wire, bare.—				
Total	£	26,000	51,000	+ 25,000
From United Kingdom ...		21,000	33,000	+ 11,000
,, Japan		2,000	—	− 2,000
,, United States ...		2,000	6,000	+ 4,000
Iron telegraph and telephone wire.—				
Total	tons	141	24	− 117
	£	5,360	646	− 4,714
,, United States	tons	5	24	+ 19
	£	330	646	+ 316
Gas, oil and hot air engines, other than for traction.—				
Total		66,000	118,000	+ 52,000
From United Kingdom ...		32,000	62,000	+ 30,000
,, United States ...		31,000	50,000	+ 19,000
Steam engines over 1,000 *i.h.p.—*				
Total		—	6,000	+ 6,000
From United States ...		—	6,000	+ 6,000
Steam engines, 1,000 *i.h.p. and under.—*				
Total		6,000	13,000	+ 7,000
From United Kingdom ...		5,000	9,000	+ 4,000
,, United States ...		1,000	4,000	+ 3,000
Steam boilers, over 500 *i.h.p.—*				
Total		1,500	2,000	+ 500
From United Kingdom ...		1,500	2,000	+ 500
Steam boilers, 500 *i.h.p. and under, feed-water heaters, &c.—*				
Total		8,000	28,000	+ 20,000
From United Kingdom ...		8,000	28,000	+ 20,000

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The Wayne Self-Winding Cable Reel.

The disadvantages of wall sockets, plugs, and trailing flexibles for workshop use are well known, but hitherto it has not been possible to dispense with them, where portable lamps or tools have to be provided for. The new cable reel which has been introduced by the Wayne Engineering and Equipment Co., of 111, Great Portland Street, W.1, should go far to fill the needs of such cases. As shown in fig. 1, it consists of a drum 14½ in. in diameter and 4 in. wide, free to swivel on a baseplate, and carrying a three-wire cable 25 ft. in length. The cable can be drawn out freely in any direction, and is automatically locked at any desired distance from the reel, while it is also automatically returned to the drum when not in use. All parts are accurately made and interchangeable, and a substantial gauge of metal is used to ensure strength and durability. Continuous connection with the supply circuit and with the earth wire is maintained by ingenious sliding contacts, of which that on the swivel base is shown in fig. 2, and that on the side of the drum in fig. 3; the latter also shows the automatic locking device which engages with one or other of the pins seen on the flange of the drum. The bearings are of phosphor-bronze. All metal parts are thoroughly insulated, and the provision of an earthing lead in the cable, with a reliable connection to the earthing wire, ensures the safety of the user. Details are shown in the vertical section, fig. 3, from which it will be seen that the main terminals are readily accessible; the wide bearing face of the swivelling member imparts rigidity to the device, and a guide leads the cable on the drum in rewinding. We have inspected the reel and its component parts, and consider the design to represent a thoroughly good engineering job. By keeping the flexible out of the way of damage its life will be greatly prolonged, and as the reel swivels easily in any direction, the cable can be pulled out or rewound with the greatest ease. On the sample we examined, cab-tire sheathed cable was used. Accidental knotting of the cable is impossible, and the lamp or tool can be used anywhere over a wide radius.

Fig. 1.—The Wayne Self-winding Cable Reel.

Fig. 2.—Contacts on Base.

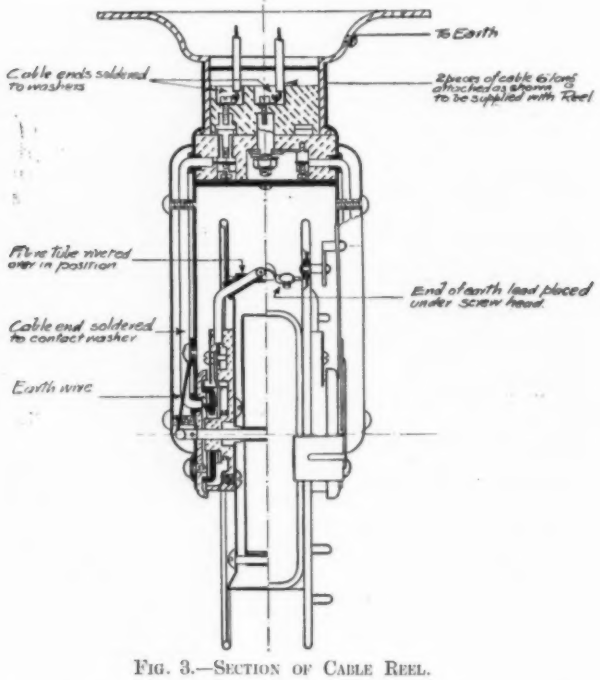

To Earth
Cable ends soldered to washers
2 pieces of cable 6 long attached as shown to be supplied with Reel
Fibre Tube riveted over in position
End of earth lead placed under screw head.
Cable end soldered to contact washer
Earth wire

Fig. 3.—Section of Cable Reel.

The "Ritter" X-ray Dental Outfit.

Among the exhibits in the recent Dental Exhibition were number of "Ritter" X-ray dental outfits. The principal British agents for this apparatus are Messrs. de Trey & Co., Ltd., 23, Swallow Street, Piccadilly, W.1. This set (fig. 4) has been designed exclusively for dental photography, and several new features are embodied in its construction. The Coolidge tube used in conjunction with the apparatus is of the radiator dental right-angle type, it is enclosed in a lead glass shield equivalent to a protection of 1/16 in. of lead. The transformer is immersed in oil, and has a range of connections which allows the machine to be adapted to practically all normal currents, direct and alternating. There is also an auto-transformer which permits the maintenance of voltage to balance any fluctuations in the supply. The tube holder can be rotated horizontally or moved in a vertical direction, and remains in position without the use of thumbscrews, &c. The angles of adjustment can be read and recorded for future use. The "Ritter" apparatus is provided with an automatic self-winding time switch which may be set to operate at periods ranging from zero to 12 sec.

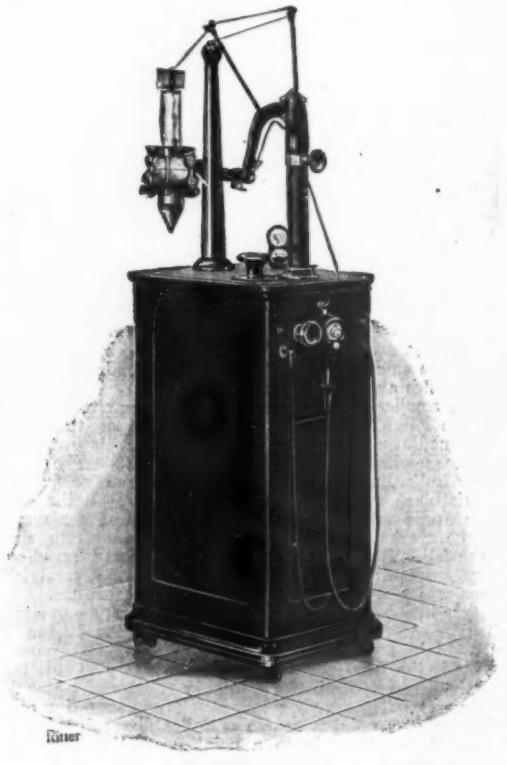


Fig. 4.—The "Ritter" X-ray Dental Outfit.

"DELAS" AIR EXTRACTORS.

The "Delas" system of air extraction, manufactured by Messrs. Cole, Marchent & Morley, Ltd., under licence from La Société Condenseur Delas, of Paris, has been developed with the object of securing stability of operation and increased efficiency.

It is known that, other things being equal, the degree of vacuum depends on the distance, signified by D in fig. 1, between the throat of the diffuser and the end of the steam nozzle. By increasing this distance the friction surface and the weight of air withdrawn are increased, and a higher vacuum is created. If the distance becomes too great, a drop in vacuum is noticed, and at the same time an ever-increasing rise in the temperature of the convergent resulting in the failure of the extractor. The inventor was thus led to believe that failure started with this increase in temperature, and would be obviated if the convergent were kept cold. He proved this in the following manner:—

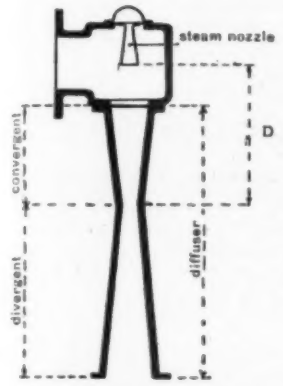


Fig. 1.—Diagram Illustrating Degree of Vacuum.

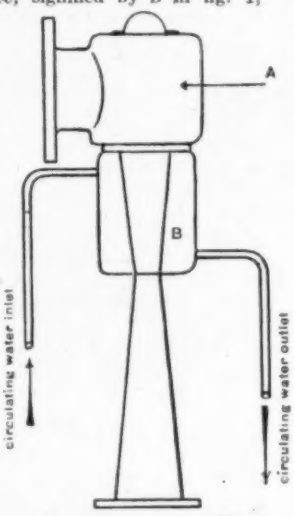


Fig. 2.—Extractor Fitted with Water Jacket.

An extractor A, see fig. 2, was fitted with a water jacket B, encircling the convergent and was at first started up without the water being introduced. The distance between the steam nozzle and the throat of the diffuser was gradually increased until the apparatus failed, when the vacuum registered only 11 inches. The circulating water was then introduced and at once the vacuum rose to 28 inches. Normal working commenced with perfect stability and, better still, when the nozzle was further removed, a still greater weight of air was withdrawn, which caused a corresponding increase in the vacuum. This modification has also simplified manufacture and enabled a very high vacuum with absolute stability to be obtained, and at the same time an almost isothermic and very economical working of the extractors.

It will be seen from the above, and it has been proved by careful experiments under varying conditions of steam pressure and air extraction, that a water-cooled convergent parallel diffuser has a degree of stability such that failure is practically impossible even with very low steam pressures at the nozzles and a largely-increased amount of air extracted.

It is well known that the extracted air is compressed to atmospheric pressure in the diffuser. In a convergent divergent ordinary diffuser the compression is adiabatic, and the temperature at the discharge outlet shows an appreciable degree of superheating, in cases as much as 518 deg. F. total temperature. In the "Delas" air extractors having a cooled diffuser, the discharge temperature is between 212 and 215 deg. F., which practically corresponds to atmospheric pressure. The compression line is, therefore, in the first case adiabatic, as the upper curve in fig. 3, and in the second case, that is with a cooled diffuser, isothermic, *i.e.*, as the adjacent line. The shaded area between these curves represents work which the water circulation renders unnecessary, thus showing an increase in the efficiency of the apparatus, and enabling it to do the same duty with a reduced steam consumption.

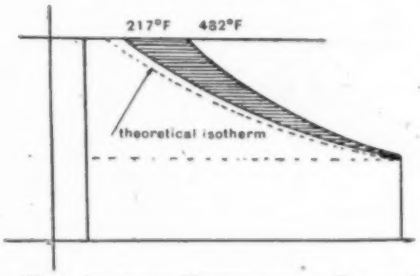
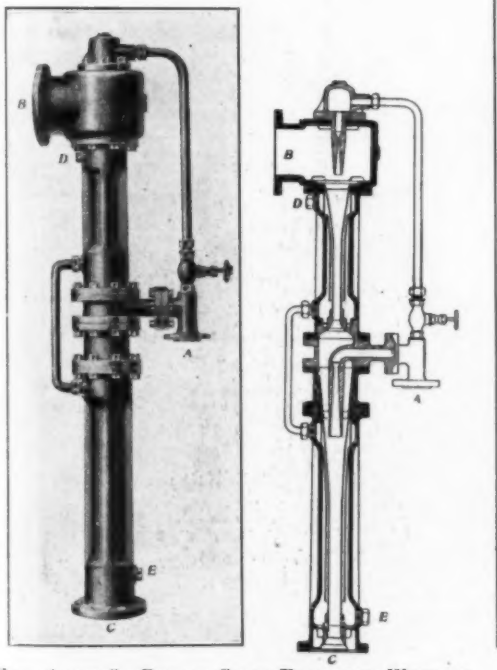
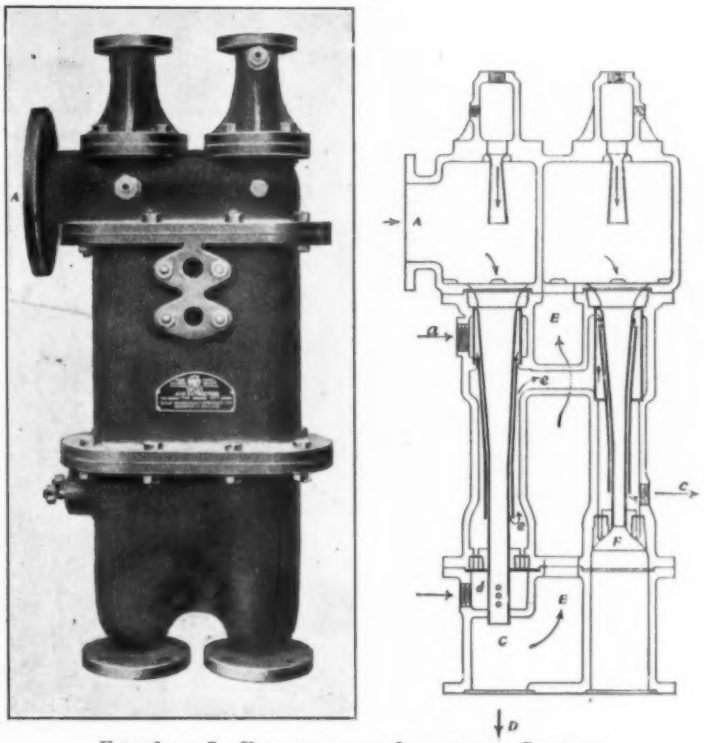


Fig. 3.—Work Rendered Unnecessary by Cooled Diffuser.



Figs. 4 and 5.—Double Stage Extractor Without Intermediate Condenser.



Figs. 6 and 7.—Extractor with Intermediate Condenser.

Three types of extractor are manufactured. The first is a single stage extractor, the second a double compression stage extractor with a single nozzle on each stage and total recuperation of heat units in the feed water, while the third is supplied with an intermediate condenser, likewise with two compression stages and a single nozzle at each stage, the heat of the second stage being always recoverable.

The single stage extractor is illustrated by the top half of figs. 4 and 5 (except for the arrangement of the steam stop valve).

The double stage extractor without intermediate condenser is shown by the complete figs. 4 and 5, and it will be seen that the working steam enters through the opening A and the air is extracted from the condenser through B, while the mixture is discharged through the end C to the feed tank. The cooling water, which is drawn from the condenser circulating water system, enters at D and passes out at E.

With the exception of the small amount of heat (5 per cent. at most) carried away by the circulating water, all the heat units in the working steam may be recovered in the feed water.

In the extractor with intermediate condenser a mixing condenser is inserted between the two compression stages, which, when supplied with a small amount of injection water, condenses the steam that has done duty in the first stage. This ensures a reduction in the steam consumption of the second stage, since only the air coming from the first has to be compressed.

This third type possesses all the advantages of the first, with the addition that reliability and economy are evident in a more pronounced degree.

For an explanation of the method of working reference should be made to figs. 6 and 7, in which it will be seen that air from the condenser enters at A and is compressed for the first time as far as *dc*. A jet of injection water is admitted through the holes *d* and condenses the steam of the first stage, while the injection water and condensed steam flows away through the outlet D and returns to the main condenser through a U tube. The incondensable gases, freed from steam, are drawn along in the direction of the arrows E and are compressed a second time as far as F, whence, with the steam of the second stage, tney are discharged to atmosphere usually through a feed water heater in which the steam is condensed, the heat being absorbed by the feed water. The circulating water enters at the opening *a* and follows the arrows *e* until it passes out through the outlet *c*.

NEW PATENTS APPLIED FOR, 1921.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

26,060. "Device for recording and checking telephone calls." J. E. Copeland, C. W. Cooke, W. Rogers, and W. C. Sutherland. October 3rd.
26,078. "Electric junction boxes." E. A. Claremont and G. H. Scholes. October 3rd.
26,089. "Relays for reception of signals, vibrations, &c." C. P. Ryan. October 3rd.
26,098. "Automatic electricity meter." O. K. Heesch. October 3rd. (Denmark, August 27th.)
26,102. "Electric switches." C. G. Bennett. October 3rd.
26,125. "Electric switches." C. W. Denny. October 3rd.
26,127. "Transmission of signals by electric oscillations." Dr. E. F. Huth Ges. and J. Oppenheimer, October 3rd. (Germany, October 2nd, 1920.)
26,135. "Incandescent electric lamps for advertising, &c." P. Geniller. October 3rd.
26,141. "Electric incandescent lamps." Sir D. L. Goldsmid-Stern Salomons (G. Fayol). October 3rd.
26,147. "Electric pocket lamps." M. Lindner. October 3rd.
26,162. "Indirect lighting fitting." Smith & Ansell, Ltd. October 4th.
26,168. "Sparking-plugs." W. H. Shute. October 4th.
26,212. "Electric appliances for seam or line welding." W. J. Rickets. October 4th.
26,214. "Electrolytic cells for generating oxygen and hydrogen." I. H. Levin. October 4th.
26,220. "Radio-telephone transmitter." H. S. Walker. October 4th.
26,227. "Telephone mouthpieces." J. Jofch. October 4th.
26,229. "Production of electrolytic iron." Soc. Anon Le Fer. October 4th. (France, October 19th, 1920.)
26,238. "Electrically-heated vulcanising apparatus." H. Frost & Co., Ltd., and W. Frost. October 4th.
26,258. "Overhead electric transmission." A. M. Taylor. October 5th.
26,291. "Electric lamps." E. J. L. Brook. October 5th.
26,302. "Electrical control for lifts, haulage gear, &c." Electric Control, Ltd., and O. Ellefsen. October 5th.
26,307. "Combined electric switches and fuses." J. J. J. M. Kluijtmans and Phi-Kappa Syndicate, Ltd. October 5th.
26,308. "Electric heating apparatus." Phi-Kappa Syndicate, Ltd., and D. Watson. October 5th.
26,314. "Means of releasing arms of starting-gates by electric power." I. Cash. October 5th. (Union of South Africa, October 11th, 1920.)
26,316. "Cathodes of thermionic valves, &c." P. G. A. H. Voigt. October 5th.
26,322. "Wireless signalling systems." British Thomson-Houston Co., Ltd. (General Electric Co.). October 5th.
26,330. "Magnetic blow-out devices for electric circuit-controlling apparatus." J. Anderson and G. Ellison. October 5th.
26,354. "Submarine telegraph cables." H. W. Sullivan. October 5th.
26,355. "Automatic exchange telephone apparatus." W. Stott and Telephone Manufacturing Co. (1920), Ltd. October 5th.
26,366. "Horizontal electrically-driven pumps." D. J. Walters. October 6th.
26,382. "Sparking-plug." R. L. Broadwood. October 6th.
26,388. "Direct-current dynamo." A. Wall. October 6th.
26,417. "Commutators." E. C. Hatcher. October 6th.
26,425. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. October 6th. (United States, October 15th, 1920.)
26,427. "Electric lamps." T. Rombach. October 6th.
26,431. "Wireless signalling systems." British Thomson-Houston Co., Ltd. (General Electric Co.). October 6th.
26,436. "Electric lighting dynamo and accumulator sets." J. R. Middleton and Watts Williams & Co., Ltd. October 6th.
26,445. "Process for staking-out a route by phonic cables." W. A. Loth. October 6th.
26,449. "Electric inductances and inductance coils, &c." R. T. Smith. October 6th.
26,466. "Electric switch." W. P. Bryan and G. H. Tatham. October 6th.
26,475. "Wireless telegraphy." H. Abraham. October 6th. (France, October 6th, 1920.)
26,478. "Radiological table for examining the human body by X-rays." H. H. Carelli and E. Sordelli. October 6th.
26,501. "Storage of electric fuse wire." S. Fildes. October 7th.
26,511. "Electric switches." A. Hougardy. October 7th.
26,541. "Commutator rotating disk and terminal for ignition sets." J. Judge. October 7th.
26,549. "Electro-magnetic brakes." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). October 7th.
26,550. "Electro-magnetic brakes." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). October 7th.
26,553. "Electric heating and cooking apparatus." J. J. J. M. Kluijtmans & Phi-Kappa Syndicate, Ltd. October 7th.
26,61. "Electric lamps and fans." H. H. Berry. October 7th.
26,567. "Electric current-interrupting devices." Chamberlain & Hookham, Ltd., and S. James. October 7th.
26,568. "Commutators, &c., for electric ignition systems." C. Valentine. October 7th.
26,580. "Electric-signalling devices." British Thomson-Houston Co., Ltd. (General Electric Co.). October 7th.
26,585. "Electric lamps." G. C. Hermet and L. A. Izoard. October 7th.
26,589. "Electric ignition apparatus." H. P. Amphlett and J. E. Lewis. October 7th.
26,608. "Sparking-plugs." C. A. West. October 8th.
26,609. "Sparking-plugs." C. A. West. October 8th.
26,612. "High-tension ignition systems for internal-combustion engines" R Bosch Akt.-Ges. October 8th. (Germany, October 23rd, 1920.)

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1920.

8,083. "Means for changing the poles of four-plane windings of alternating-current dynamo-electric machines." Siemens-Schuckertwerke Ges. June 30th, 1917. (140,451.)
8,793. "Electric arc welding systems." C. J. Holslag. March 25th, 1920. (169,191.)
9,880. "Electrical generating systems." Industrial Research Corporation. April 8th, 1919. (141,364.)
10,961. "Electric arc systems, and particularly electric arc welding systems." Lincoln Electric Co. February 26th, 1915. (142,105.)
13,721. "Electric faucets." H. K. Glover. May 18th, 1920. (169,190.)
13,931. "Systems of electric control for dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co.). May 20th, 1920. (169,208.)
16,459. "Fittings for electric pin insulators and the like." G. V. Twiss. June 17th, 1920. (169,239.)
16,501. "Protective arrangements for alternating-current systems." Siemens-Schuckertwerke Ges. December 20th, 1918. (Addition to 138,367.) (145,436.)
16,514. "Telephone instruments." S. A. Lazarus. June 18th, 1920. (Cognate application 6,285/21.) (169,243.)
16,572. "Charging apparatus for electric-storage batteries." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). June 18th, 1920. (169,246.)
16,576. "Electrodes." J. K. Forshee. March 18th, 1920. (160,431.)
16,606. "Production of electrical oscillations by means of thermionic valves." Radio Communication Co., Ltd. June 19th, 1920. (169,250.)
16,672. "Method of securing metallic contact or electrical continuity between unscrewed tubes and fittings in conduit wiring systems." E. J. Stockwell and Falk, Stadelmann & Co. June 21st, 1920. (169,257.)
16,945. "Electrical switchgear." W. A. Coates, D. R. Davies, and Metropolitan-Vickers Electrical Co., Ltd. June 22nd, 1920. (169,280.)
17,000. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., J. Savin, and R. Mercer. (Partly communicated by Automatic Electric Co.). June 23rd, 1920. (169,285.)
17,394. "Electrical quick make-and-break switches." H. C. Sanders. June 26th, 1920. (169,295.)
17,545. "Electrical regenerative control apparatus and systems." British Thomson-Houston Co., Ltd. (General Electric Co.). June 28th, 1920. (169,297.)
17,656. "Holders for message pads for telephones and the like." H. O. Quinn. June 29th, 1920. (169,299.)
18,223. "Apparatus for the reception of electro-magnetic waves." L. H. Parsons and A. E. J. Fall June 2nd, 1920. (169,305.)
18,578. "Incandescent electric lamps." W. J. Cameron. February 14th, 1916. (146,474.)
18,644. "Telegraphic ciphering and deciphering mechanism." Western Electric Co., Ltd. September 13th, 1918. (146,520.)
18,653. "Receivers of electrical oscillations." Radio Corporation of America. June 18th, 1914. (146,529.)
18,799. "Wireless signalling apparatus." Western Electric Co., Ltd. December 1st, 1915. (146,881.)
19,331. "Arc transmitters for wireless telegraphy and telephony." Ges fur Drahtlose Telegraphie. July 3rd, 1914. (147,428.)
19,339. "Wireless transmitters." Ges fur Drahtlose Telegraphie. December 6th, 1913. (147,436.)
19,560. "Telephone systems." Western Electric Co., Ltd. February 20th, 1919. (147,610.)
19,901. "Generation of electric oscillations." Ges fur Drahtlose Telegraphie. September 29th, 1917. (147,843.)
20,145. "Choking coil with variable inductance or transformer for doubling frequency." Allgemeine Elektricitats Ges. July 4th, 1914. (148,221.)
20,361. "Sound transmitting arrangement." Signal Ges. April 14th, 1919. (Addition to 147,945.) (148,416.)
20,833. "Diaphragms for submarine sound-signalling apparatus." Signal Ges. March 18th, 1916. (148,973.)
21,149. "Portable electric hand lamps." H. Wade (Concordia Elektrizitats Akt.-Ges.). July 13th, 1920. (169,324.)
21,505. "Electric switches." Z. R. Della Veneria. July 16th, 1920. (169,330.)
21,655. "Absorbents for use in galvanic batteries." J. A. Van Der Nolle. July 19th, 1919. (149,330.)
21,899. "Electric switches." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). July 21st, 1920. (169,340.)
22,991. "Bromide electric printing boxes." H. Booker. October 23rd, 1920. (169,359.)
23,427. "Electric letter-forming apparatus for advertising and the like." F. Silbermann. August 10th, 1920. (169,361.)
25,675. "Rotary electric distributors for internal-combustion engines." C. L. Atkinson. September 6th, 1920. (169,377.)
29,959. "Submarine vessels." Electric Boat Co. January 24th, 1920. (158,223.)
30,853. "Igniter or sparker of cerium metal alloys for pyrophoric ignition devices and the like." Kunheim & Co. October 31st, 1919. (153,306.)
30,946. "Sparking plugs." A. W. Armstrong. November 2nd, 1920. (169,395.)

1921.

10,700. "Control of alternating current electric motors." Metropolitan-Vickers Electrical Co., Ltd. July 30th, 1920. (167,145.)
16,574. "Electric magnetic wave transmission systems." Soc. Francaise Radio-Electrique. October 16th 1919. (Divided application on 137,465.) (Addition to 147,465.) (165,037.)